Canada's Forest Industry

the next twenty years: prospects & priorities

Wood Products

SIMONS Woodbridge, Reed & Associates

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IV Wood Products

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VOLUME IV

WOOD PRODUCTS

TABLE OF CONTENTS

PREFACE
TO VOLUME IV

This study of the Canadian Forest Products Sector was commissioned by the Canadian Forestry Service. The purpose of the study is to assess the development potential for the sector. The study assesses the demand outlook for existing and potential forest products, the current and potential competitive position of the various sub-sectors of the industry in Canada and the available resources.

The full report on this study comprises six volumes. The contents of the full report are outlined as follows:

Volume I	Strategic Analysis
Volume II	World Demand - Supply
Volume III	Pulp and Paper
Volume IV	Wood Products
Volume V	Fibre Assumptions
Volume VI	Cost Projections

Volume IV details the market outlook and competitive position for wood products. The product/market analysis culminates in the definition of a national as well as a set of regional industrial development scenarios. In view of the changes taking place in the environment in which the wood products sector operates, scenarios have been developed for both the short term (1995) and long term (2010).

It is designed to provide "stand alone" analyses for lumber and panel products separately. There is, however, some significant overlap in terms of the markets. For example, the technological changes in residential construction in Japan have an impact both on lumber and structural panel products. Consequently, in order to avoid excessive repetition, there are some cross references between the two main sections.

Our approach begins with an overview of the significant issues, findings and conclusions. This overview is followed by an analysis of the major markets that are of potential significance to Canada. The analysis of the potential demand leads to a discussion of Canada's competitive position relative to other supply sources. These sources and their outlook are analyzed in Volume II.

The overall potential for Canada is then analyzed in detail by region and in relation to the industry and fibre resources in the region. To some extent, there is a degree of commonality across the regions, e.g., in terms of lumber to be sold to the US, or the specialty options open to the smaller, less efficient operations.

There are, however, significant differences due to geographic location and the quality of fibre. The Japanese demand for hemlock component stock, for example, is of little relevance to Ontario (apart from the effect of displacing fibre that might otherwise compete with Ontario on the US market).

Though for panel products there is little constraint expected as a result of raw material supply, there are expected to be some limitations relative to lumber. Lumber is a mature product and growth overall is not dramatic. There is, nevertheless, growth and this growth results in a market-driven opportunity for Canada. The regional analyses assess the extent to which each region has the necessary suitable fibre to satisfy the market opportunities.

This volume takes the analysis only to the stage of a development scenario for each product sector. The integration of the various products into a national multi-product development scenario is presented in Volume I of this study.

1

LUMBER

TABLE OF CONTENTS

Overview

The lumber industry, worldwide, is mature relative to most other sectors of the forest industry. In overall terms, there are a few fundamental changes that can be foreseen. Most consumption will continue to relate to various forms of construction and most of the demand will be for basic commodity products. Though some modest growth in consumption is projected, the increases will be less than the overall growth in GNP due to continued penetration by substitute products--metal studs, PVC windows, steel doors, etc.

Despite this apparently static overall outlook, there are a number of trends that are apparent:

* the softwood lumber trade will continue to be dominated, in volume terms, by basic construction grades. Competitive pressures for this market will result in static or declining real prices and the focus of producers will be on cost minimization;
* commodity and lower grades from plantation forests (e.g. in Chile, New Zealand) will be increasingly available and there will be an increased supply in Western Europe;
* the increasing use of engineered wood structures demanding wood products with closely defined physical characteristics;
* manufacturers of products using lumber (e.g. doors, windows) will increasingly prefer precut components rather than raw material for remanufacture;
* innovative combinations of wood fibre and of wood and other materials will combat substitution by other products and will develop new demand.

The likely responses of the lumber industry will be in two very different directions. One will be to develop larger or more efficient plants for the production of a limited range of commodity grades. The other will be to emphasize small specialty operations focusing on niche markets. The size and nature of the resource in each region or, indeed, location within each region will dictate which route is preferable.

Size and Nature of the Market

Worldwide consumption of lumber in 1985 was approximately 460 million m^3.[1] With the increases that are known to have occurred in North America, Western Europe and Japan, it is likely that the 1987 volume was close to 500 million m^3. Softwood lumber accounts for approximately 75% of total lumber shipment.

Though there are a variety of consumption sectors where softwoods and hardwoods compete directly, for the majority, the two satisfy different markets. Since the temperate hardwood resource in Canada is both relatively small and quite different from the major worldwide hardwoods, the focus of the analysis will be on softwood lumber.

The softwood lumber industry, both in terms of products and consumption, is concentrated in North America, the USSR, Europe and Japan. The following chart (Figure 1-1) demonstrates the balance between domestic shipments, imports and exports. Canada has by far the strongest export position, followed by the Nordic countries and the USSR. The US and Western Europe are the only regions where imports play a major part in satisfying domestic consumption. Even Japan, which is generally regarded as an important export market for Canada, only imports 15% of its softwood lumber consumption. Imports of softwood logs, however, provide the raw material for half of the domestic production in Japan.

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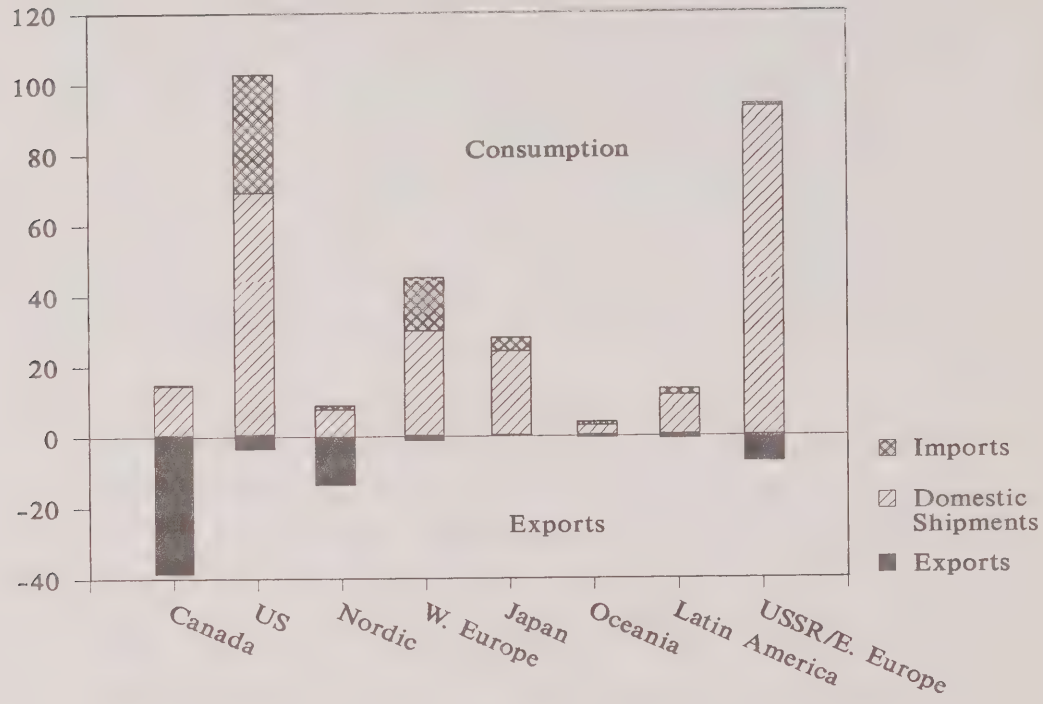
[1] With the exception of a few instances when referring to North America, lumber volumes have been quoted in metric terms throughout. The mathematical conversion is 1 m^3 = 424 board feet.

Unfortunately, there are some inherent dangers in converting from board feet in the North American context. The common practice in North America is to sell dimension lumber on the basis of nominal board feet where actual volume can vary from 66% to 75% of nominal volumes depending on the specification. The standard practice adopted by Statistics Canada has been to convert on the basis of the mathematical equivalent. This approach has been adopted throughout this report.

Figure 1-1
1985 Softwood Lumber Consumption and Trade
(millions of tonnes)



Source: FAO, WRA

It is apparent, therefore, that domestic production is the predominant factor in worldwide terms. Furthermore, an analysis of the major trade flows (Figure 1-2) demonstrates the influence of Canada/US trade. If this single trade flow is eliminated, the significance of interregional trade is reduced to less than 10% of total domestic consumption.

Figure 1-2
1985 Major Trade Flows of Softwood Lumber
(millions of m^3)

Source: FAO, WRA

It is apparent, therefore, that a country such as Canada, which depends on exports, is very vulnerable to changes in local domestic supply/demand balances. These changes can be in overall volumes or in specific consumption sectors requiring particular specifications. It is essential, therefore, that the exporting country is very responsive to these changes and detailed market awareness must be an ongoing strategy of Canadian offshore exporters.

A strategy of this nature is also critical in the light of the historical instability of prices for commodity grades. An analysis of prices in constant dollar terms since 1970 (Figure 1-3) shows both the declining trend and the significant fluctuations even on an annual average basis. Monthly variations are often even more dramatic with changes of up to 25-30% occurring in one or two months.

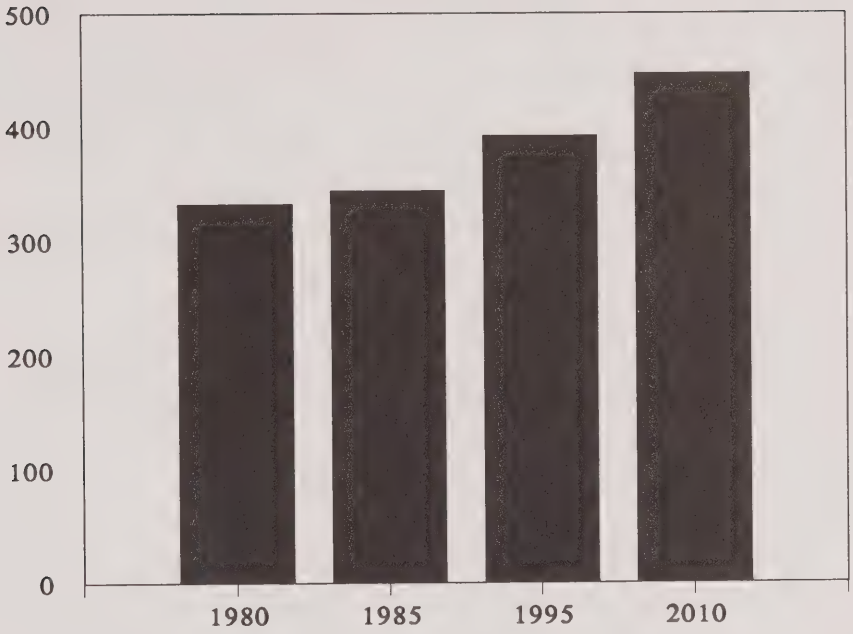
Figure 1-3
Softwood Lumber Price History
1970-1987
(1986 US$/MBF)

Source: Random Lengths (Western SPF 2x4)

Demand Outlook

The long-term worldwide demand outlook is shown in Figure 1-4. Though a significant increase is shown in the 10 year period from 1985 to 1995, it should be noted that current estimates for 1987 consumption indicate that substantial increases have already occurred. In the regions of particular relevance to Canada, i.e., US, Western Europe and Japan, the 1987 consumption level is likely to have been within less than 5% of that projected for 1995.

Figure 1-4
World Softwood Lumber Consumption
(millions of m^3)



Source: WRA

The long-term growth overall is projected at less than 1.0% per year. Though this level of annual growth is modest, it does, nevertheless, represent a substantial absolute volume of lumber. Based on what occurred in 1987, it seems likely that the gross capacity to produce the 1995 projected volume is already in place. It is questionable, however, whether it is the right capacity for the future, and it is probable that there will be significant changes. This aspect is discussed more fully later.

For the longer term, however, an additional 50 million m^3 is projected to be needed--a volume equivalent to close to total current Canadian production. It should be emphasized that a significant part of this growth is projected for centrally planned economies that are essentially insulated from the rest of the world and there is also considerable expansion expected in the developing countries--based on new domestic supply for plantation wood. The incremental volume implications to the traditional consumption in supply areas are, nevertheless, very substantial in spite of the modest increase used. Furthermore, the level of total volume increase is significantly greater than has been evident in the past 15-year period when the overall volumes only increased by a little over 30 million m^3.

There were, however, two important factors that contributed to that lesser overall increase during the earlier period. Firstly, there was a substantial decrease in apparent consumption in the USSR (16.5 million m^3). Secondly, it was a period when plywood and other panel products were rapidly penetrating lumber markets. In the long-term projections, neither of these situations is expected to occur. The USSR is expected to increase consumption and the substitution phase is believed to be over. Thus, the Western European markets are expected to show substantial gains in consumption as opposed to a slight decline. A similar situation is projected for Japan which also showed a decline in the last 15 years. New uses for specially manufactured lumber products are expected to play an important part in this growth.

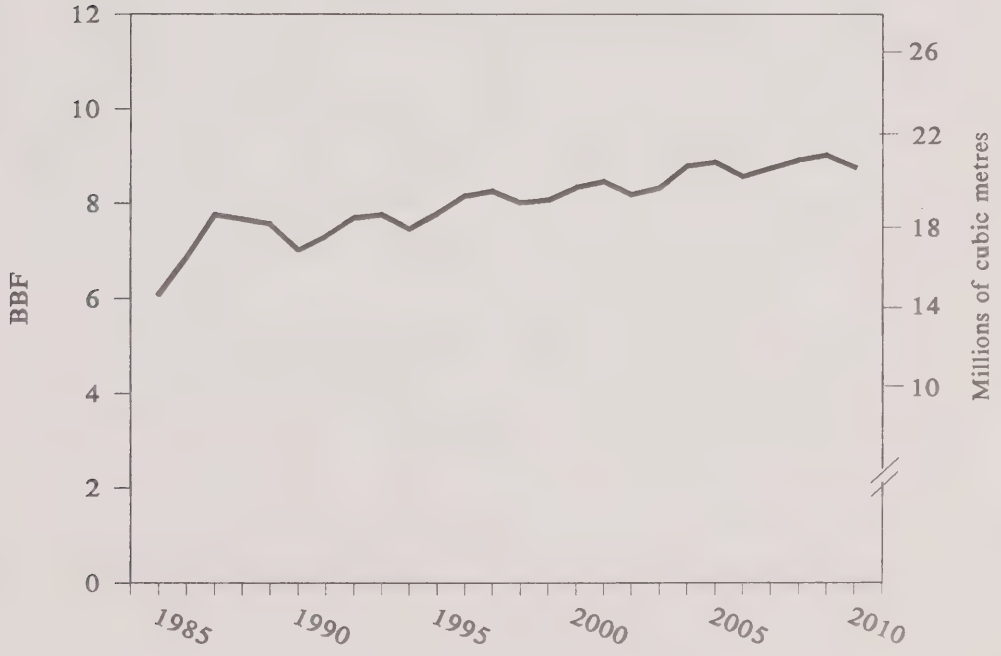
The implications to suppliers of lumber products are likely to be very significant. For Canada, in particular, there will still be a substantial demand for basic commodity construction grades. It appears highly likely, however, that there will be severe competition for these fairly static, if not declining, markets. Individual growth opportunities will, therefore, depend on being low-cost producers. The other area of opportunity will increasingly be in the production of specially designed products to fit specific market requirements.

Market Analysis

Canada

The domestic consumption of lumber in Canada tends to receive less attention in many supply/demand projections than that of the US. However, Canadian consumption represented close to 29% of 1986 softwood lumber shipments by Canadian producers. It is, therefore, of very substantial significance to the industry. The outlook for softwood lumber consumption is shown in Figure 1-5.

Figure 1-5
Canadian Consumption of Softwood Lumber
(Actual and Projected)



Source: RISI

These projections indicate a reasonably steady growth over the period without the violent fluctuations evident in the US market. The forecasts for housing starts indicate that there will be some decline in the early 1990s but not as great as that in the US.

The residential housing sector is important to lumber consumption but is estimated to consume under one-third of the lumber used in Canada. Repairs and renovations in both the residential and nonresidential sectors are believed to account for over 35% of consumption and the balance is split between nonresidential construction and a variety of industrial uses. It should be emphasized, however, that there is very little information available on consumption patterns within Canada. There is currently some analysis underway on use in residential housing to update work undertaken 20 years ago. Apart from this study, there has been no detailed analysis of how or where lumber is used within the country. The estimates used for consumption sector breakdown are, therefore, approximate.

In addition to softwood lumber, there are also small volumes of hardwood lumber consumed in Canada. Hardwood is primarily used in either high-value (e.g. furniture) or relatively low-value (e.g. pallets) products. In net trade terms, Canada is a net importer, but a significant volume of domestic production is exported - mainly to the US. According to the revised Statistics Canada data, hardwood lumber consumption is estimated at 1.3 m^3, or less than 10% of total consumption. It is estimated that hardwood lumber consumption is likely to be relatively static in the long-term.

The outlook for total consumption of lumber in the long-term to 2010 is one of continued growth. Though housing start levels are projected to decline in the long-term to around 165,000 units per year, the consumption of lumber in the other sectors will more than offset any losses caused by this decline.

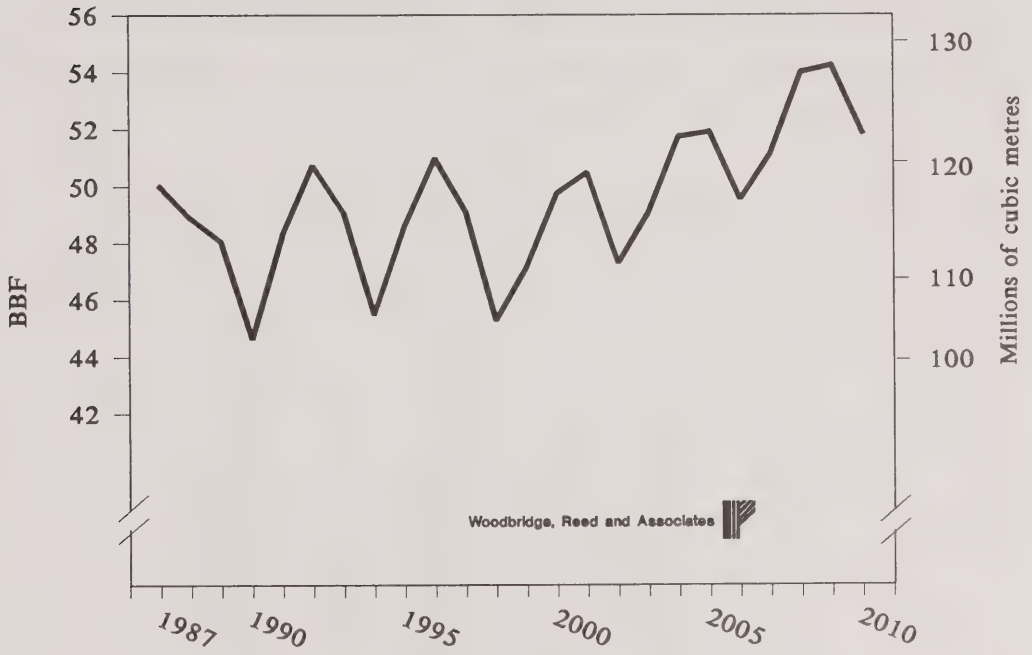
It is expected that Canadian consumption will continue to be satisfied by domestic supply, and there will be no impact from supplies from elsewhere (except for hardwood).

US

The projected outlook for lumber consumption in the US to 2010 is for modest growth, although considerable annual fluctuations are expected (Figure 1-6). For example, while the overall trend is upward, the actual volumes, in 1994, are projected to be below those of 1987.

The lumber sector will therefore continue to be plagued by large swings in demand which inevitably have a detrimental effect on the structure of the industry.

Figure 1-6
US Consumption of Softwood Lumber
(billions of board feet)

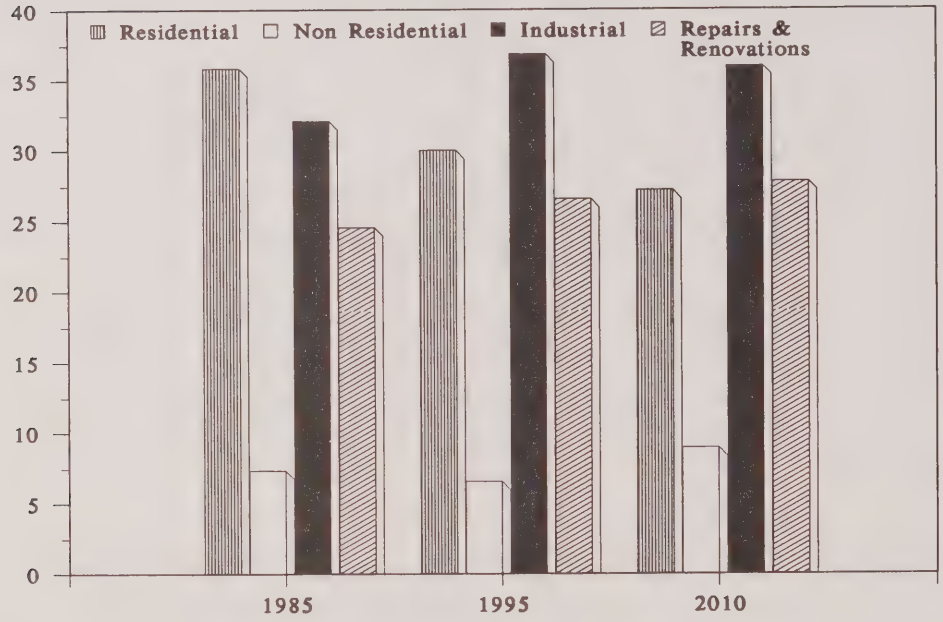


Source: RISI

The principal reason for the projected fluctuations in consumption is changes in the construction of single family houses. For example, in 1990, when total consumption is expected to drop by eight million m^3 board feet (a 7% decrease from 1987), six million m^3 of this reduction is due to the drop in consumption by housing.

An analysis of projected consumption by sector (Figure 1-7) shows that residential construction, i.e., single family, multi-family and mobile homes, is expected to become less significant over the period to 1995. Whereas, at present, this sector accounts for around 36% to 37% of consumption, this share will drop to below 30%. Of particular importance will be the industrial sector which is expected to grow from around 31% to about 37%. In volume terms, this suggests an increase of about seven million m^3 from current levels. There is also expected to be some increase in the share and amount of lumber consumed in the repairs and renovations sector.

Figure 1-7
Share of US Softwood Lumber Consumption
By Sector
(%)



Source: WRA

These shifts in consumption patterns, though relatively gradual, could have a significant impact on the nature of the US market. The effect on supply/demand balances, as the volumes fluctuate within and between categories, will be influenced by the following factors:

* the majority of the products used in residential housing is commodity lumber, and it is in this sector that the greatest fluctuations occur. Within residential housing, single family units account for the greater share of lumber consumption;

* apart from the lower qualities that are often used in pallets and crating, the products used in the industrial sector vary widely and consumers need specifications that suit their particular requirements (i.e. not commodity). This sector is growing and fluctuates less;

* the large and growing sector of Repairs and Renovations consumes a mix of commodity and specialty products. A significant proportion is in the form of semi-finished products such as doors, windows, mouldings and millwork. The manufacturers of these products increasingly demand component stock rather than commodity lumber;

* some part of the consumption in residential construction (possibly 10 to 15%) is also in the form of semi-finished products;

* there is a growing trend towards a more sophisticated use of wood as an engineered structural component. To some extent this can be met by further 'processing' commodity lumber, as in mechanical stress rating (MSR), but this trend also indicates a demand for specialty products.

It can be concluded, therefore, that although the outlook is for growth overall, the demand for commodity lumber will fluctuate significantly and the principal growth will lie with specialty products.

The US lumber market has traditionally been supplied by domestic producers and imports from Canada. The market shares by producing regions are estimated in Table 1-1.

Table 1-1
US Market Share by Producing Regions
(%)

Producing Region	1985	First Half 1980s
US South	24	25-26
US Inland	20	21
US Coast	16	17
US Other	7	7
Canada	33	29-30
Total	**100**	

Source: WRA

It should be noted, however, that 1985 was a particularly strong year for Canadian imports and a more typical breakdown for the first half of the 1980s would be as shown in the second column.

The outlook to 1995, assuming a continuation of an export duty/higher stumpage situation for Canada, is for a slight drop in the Canadian share to 28/29%, with the US Coast gaining slightly in the late 1980s and the US South in the first half of the 1990s.

These percentages refer to the total market. It is important, however, to consider the outlook in more detail relative to the specific demand sectors. An analysis of US production by grade indicates that a significant proportion of the production is in specifications other than regular commodity lumber for standard residential construction. In the US South, for example, up to 50% is now treated with preservative and little of the Ponderosa pine production in the Inland area is now sold as regular dimension lumber. So, although Canadian imports amount to about 30% of total US lumber consumption, the Canadian share of standard commodity construction grade lumber is at a much higher level--probably 40% to 45%.

There will continue to be a good demand for commodity lumber in the US. However, bearing in mind the comments made earlier about the overall trends and likely fluctuations for commodity lumber, the outlook for Canadian imports is for instability unless there is a greater emphasis placed on the more specialized products.

It is also important to note that Canada currently accounts for virtually all imports of softwood lumber. It is highly likely that increasing volumes of commodity grades will become available from Latin American, particularly Chilean, sources. The new mills that will be built to process the increasing volume of radiata pine sawlogs will have kilns and planers capable of producing a product suitable for the US market. Wood costs are low and, despite transportation disadvantages, this new production is likely to compete with Canadian suppliers of commodity grades.

In summary, the market-driven opportunities for softwood lumber sales to the US from Canada to 1995 are:

* **Commodity Construction Lumber**
  A large proportion of the market but little demand growth projected; cyclical fluctuations; increasing competition from other exporters; proportionate increase in US production as resource quality declines (e.g. Pacific Northwest) and reduces the opportunity to extract higher-value grades.

* **Structural Specialties**
  Currently a small share of the market but with considerable growth expected; competition likely from US suppliers utilizing species with high strength values, such as Southern Yellow Pine, but offset by other less desirable characteristics such as instability, hardness, etc.

* **Appearance Grades**
  Increasing demand and still available from Canadian resource if the product is extracted; US supplies of mature timber able to yield those grades are declining.

* **Semi-manufactured Products**
  Considerable demand growth and good opportunities for Canadian suppliers but strong competition from US mills better located and in closer contact with consumers.

In the long-term, i.e. from 1995 to 2010, the prospects for growth continue. The low levels of housing starts predicted up to the mid-1990s are projected to continue throughout the decade but are expected to improve in the period 2000-2010. In addition, there is expected to be continued growth in the other demand sectors.

On the supply side, however, it is projected that US productive capacity will peak in the early/mid-1990s and be unable to meet the increased demand. Imports will therefore satisfy an increasing share of consumption, growing from the 28% level in the mid-1990s to 33% in the year 2010.

Even though increasing supplies from competitive sources such as Latin America can be expected, it seems likely that Canadian mills can continue to rely on a strong demand (on average) from the US.

It should be noted, however, that the projections used are those developed by RISI. The most recent projections by the US Department of Agriculture (prepared 1985/86) suggest that, as a result of the 15% tax/higher stumpage in Canada, the demand on domestic US supplies will increase. This increase will result in higher prices for softwood sawlogs and therefore higher prices for lumber. As a result of these price increases, consumption will go down. The combined effect of lower consumption and greater domestic production will be a drastic reduction in imports. Thus, from an import level of 13.4 billion board feet in 1984 (the base year used in the USDA analysis), the imports are reduced to 7.4 billion in the year 2000 and only 5.5 billion by 2010.

Such an outlook would have a disastrous effect on the Canadian forest industry. There is some question, however, whether the USDA projections are realistic. Two aspects in particular seem very questionable.

* the USDA projections of consumption are so low that the volume estimated for 2000 is about five billion board feet less than was actually consumed in 1986;
* substantial increases in US lumber production are assumed, yet most projections indicate that it could be difficult to sustain, continuously, current production levels.

These projections both suggest gross changes in the future which are difficult to believe, and it is concluded that the RISI approach appears more realistic.

In addition to the softwood lumber consumed in the US, there is also a small proportion of hardwood lumber - about 10% of total lumber consumption. The great majority of this volume is produced domestically, while imports and exports, each representing less than 10% of production/consumption, are approximately equal. It is believed that the prospects for growth in production exceed those of consumption, and it is likely that exports of hardwood lumber will increase.

It is therefore concluded that the US market will not offer a growth opportunity for the limited production of hardwood lumber in Canada.

Europe

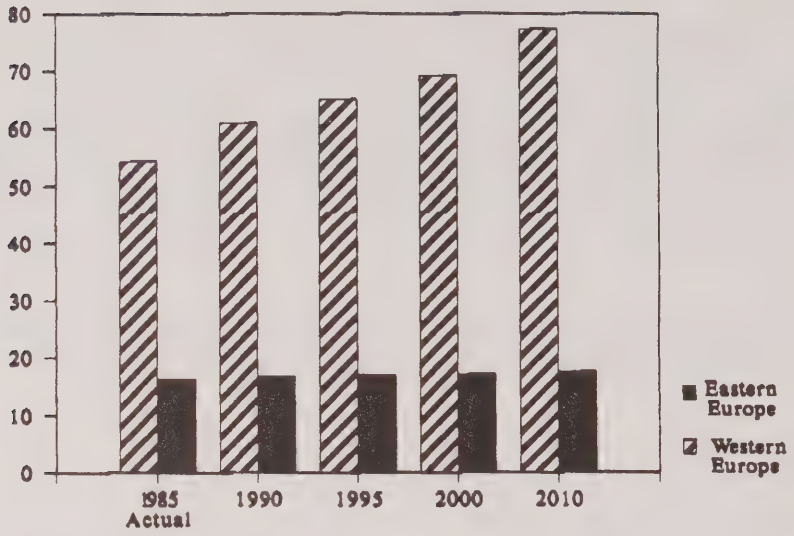
European consumption of sawn softwoods will become an increasingly important factor to Canadian lumber producers. Europe is a net importer of wood products and the outlook is for an increasing deficit in self-sufficiency.

This outlook results from a series of factors which will combine to increase forecast European sawn softwood demands:

* slow but positive population growth;
* stable European economy strengthened by EEC expansion;
* continued pressure on potential forestation sites by alternative uses;
* uncertainty of impact of acid rain on forest yields;
* increase in marketplace acceptance of wood over traditional building products such as brick, stone, etc.

The projected growth in consumption of softwood lumber is shown in Figure 1-7. Though no dramatic growth is expected, the additional volumes that will be required by the end of the century are very significant.

Figure 1-8
European Softwood Lumber Consumption
(millions of cubic metres)



Source: ETTS IV, WRA

The projections for Europe are largely drawn from a major study jointly undertaken recently by the FAO and the Economic Commission for Europe in Geneva. This study analyzed consumption trends in depth and provided two levels of projections - low and high. After discussions with the authors, the levels that are used for the purposes of this analysis are close to the low level projections.

Some increases are expected in per capita consumption, but these are expected to vary significantly by region (Table 1-2).

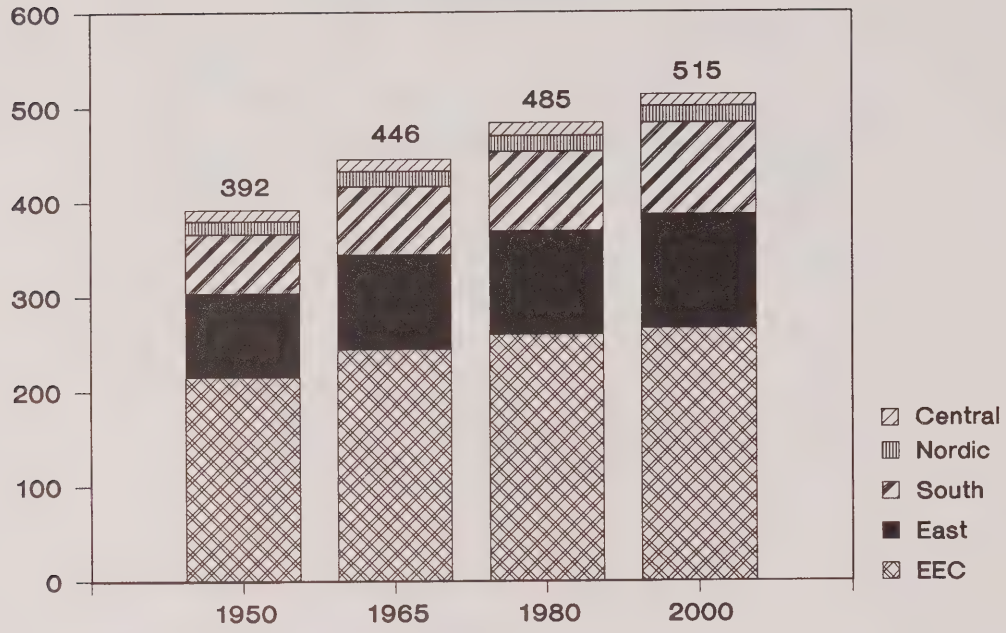
Table 1-2
Estimate of European Annual Per Capita Consumption of Sawnwood[1]
(m^3)

	1979-81	Probable 2000 Scenario
Nordic Countries	0.621	0.646
EEC (9)	0.194	0.234
Central Europe	0.367	0.450
Southern Europe	0.111	0.138
Eastern Europe	0.198	0.198
Total Europe	**0.193**	**0.208**

Source: ETTS IV Table 13.2
[1] Includes soft and hardwood

These per capita consumption projections must be related to projections of population for the equivalent regions. On the basis of current UN forecasts, it is apparent that changes foreseen for population in the northern part of Europe are relatively minor but are considerably greater in southern and eastern Europe. The long-term development of European population is shown in Figure 1-9.

Figure 1-9
Population Trends - Europe
(millions)



Source: ETTS IV

Sawn Softwood - Major End Uses

Construction in general accounts for about 70% of consumption of softwood lumber in Europe. The balance is mainly in a variety of industrial uses and furniture.

Of the total consumption of sawn softwood accounted for by construction, just over one-third each is used for structural framing and building joinery (including flooring, etc.), and roughly one-fifth for heavy (engineering) construction and form work, the remainder being taken up for other, mainly temporary, uses.

Specific major factors determining European consumption of sawn softwood are:

* **Level and Type of Residential Investment**

The current tendency in human settlement planning is away from large-scale undertakings and toward more piecemeal adaptation and upgrading of neighbourhoods. There will, therefore, be more single-family and row housing and less multi-family high-rise buildings. There are also changes underway in the number and type of households. Young people wish to live away from home before establishing permanent households. Elderly people who want to, and can live alone, require specialized housing. Increasing divorce rates increase the demand for separate dwellings.

A growing preference exists for older houses which are seen as having sufficient "character" to warrant investment of time and money in considerable renovation. There is, therefore, the prospect of further dramatic increases in consumption for repairs and renovations.

* **Technical Competitiveness of Sawn Softwood**

The increasing industrialization of building components and furniture is being matched by the availability of precisely-cut lumber with consistent quality control. In addition, there is a greater concentration on the supply of wood products that have well defined strength characteristics for engineered wood structures. Greater competition is possible, therefore, against steel and concrete.

Despite the set-back in timber frame construction in the UK, the overall trend in Europe is for growth of this type of construction .

The focus on energy conservation, especially in colder Scandinavian countries, has placed emphasis on exterior wall panels which can accommodate greater thicknesses of insulation material. The use of 2x6 studs, staggered studs, and load-bearing wall panels to achieve this additional insulation level will benefit the usage and desirability of wood.

Competition from alternative materials for building structures has been addressed by the wood industry, and several developments and trends are of interest.

The variability of a natural nonhomogeneous material like wood was traditionally cited as the reason for its exclusion as a structural material. Machine stress rating (MSR) of structural wood products now permits engineers and architects to specify the precise performance they seek without having to resort to significant and costly over-building to safely accommodate high variability.

The substitution of steel for floor and roof trusses and joints has practically been offset by the use of engineered wood beams such as solid wood chords and wood-based panels (plywood, OSB, etc.).

Reported water and snow drainage problems associated with flat-roof construction favoured for multiple-unit dwellings has seen a return to pitched roofs for low and medium-rise housing in both the Netherlands and the United Kingdom. This trend opened the opportunity for wood-frame truss manufacture in which the use of steel is relegated to that of fastener plates.

Steel prices were depressed in the early 1980s which aided its substitution as a roof-beam material in light industrial and institutional buildings. Steel is, however, energy intensive to produce and hence sensitive to changes in energy costs and availability.

There are also a multitude of other uses for lumber. The advances in manufacturing technologies permit automated mass production of identical precision wooden items such as spindles, mouldings and components. The requirements of these machining processes have caused significant developments to have taken place in the primary manufacture of the wood feed stock, primarily to reduce its variability due to both natural and man-created causes. Defects like knots, rot and splitting have required tighter emphasis to be placed on grading and the choice of appropriate grades and species. Intolerance to variations in dimensional sizes, surface finish and moisture content has required tighter controls to be placed on the primary manufacturing processes.

The more transient lifestyle favours knock-down furniture systems capable of being dismantled for transportation which minimizes transportation costs. Changes in room sizes and shapes and evolving lifestyles have encouraged a demand for items which can be assembled to form a variety of alternative shapes such as cupboards with adjustable shelving. Hybrids, involving the integration of sawn softwoods along with glass, steel and plastic components, are making best use of each material's respective merits. Edge gluing of narrow boards into boards of sufficient width for shelving or table tops is providing an alternative to plastic overlaid particleboard. The replacement of wood by plastics for furniture, which was forecast in the 1960s and 70s, has not materialized. The natural warmth and beauty of wood, along with its unique and nonuniform grain patterns, remains in demand.

Sawn softwood for packaging, which includes pallets, cases, crates, boxes, etc., is expected to maintain its position but efficiencies in design permit a reduction in the wood content per unit of packing. In addition, use of sawn softwoods for packing cases, boxes and crates for the fruit and cheese-producing sectors is declining. It is likely, therefore, that consumption in these industrial uses will increase at a slower rate than overall industrial activity.

The significant Do-It-Yourself (DIY) trend in Europe has had a favourable impact on the sale of sawn softwood. Items ranging from DIY home renovation and repairs through fencing and garden sheds are within the skill range of amateurs with traditional tools. DIY has become a widely practiced and highly publicized phenomenon of the 1970s and 80s.

In addition to the softwood lumber used in Europe, there is also a substantial volume of hardwood lumber accounting for about 25% of total lumber consumption. The majority (over 80%) of this volume is domestically produced. Most of the imports are from Africa and SE Asia, but there is a growing volume of temperate hardwoods from North America - mainly US.

The European market is a net importer of softwood lumber and despite increases projected in domestic production (for example in France, Germany and the UK), there is projected to be a growing need for imports.

An uncertain factor which could have a significant impact on the supply side of European timber is acid rain. While computer models of alternative European forest scenarios have and will continue to be built and analyzed, forecasts still range from low impact to devastation. Already, additional supplies of affected but salvageable trees are being harvested in West Germany and milled in Scandinavia. If continued, this could result in overcutting and consequent shortages of European grown timber, leaving opportunities for alternative suppliers of logs or finished lumber products in the long-term.

The nature of the imported lumber that will be required is likely to change. The availability of lumber from European sources will be primarily in the lower quality construction grades, and the nature of the resource will limit the ability of domestic sawmills to produce the higher grades for joinery or the longer lengths of wide widths. Though it should be noted that very innovative approaches are being taken to finger jointing and edge glueing in order to produce higher-value grades of lumber.

The growth opportunities for Canada will lie in the supply of products that cannot easily be produced from the European forest resource. Appearance products making use of the high quality fibre available in Canada, and the larger and longer construction specifications, will offer the best potential.

Asia-Pacific

Japan

The most significant market in this region is Japan, with a total lumber consumption in 1985 of close to 34 million m^3.

There was a substantial reduction in lumber consumption in Japan in the early 1980s. The principal factors influencing this reduction were:

- Considerably lower levels of residential construction. Housing dropped from close to two million starts per year in the mid-1970s to just over one million;

- a reduction in the market share of traditional wood-based construction from over 60% in the 1970s to 46% in 1986;

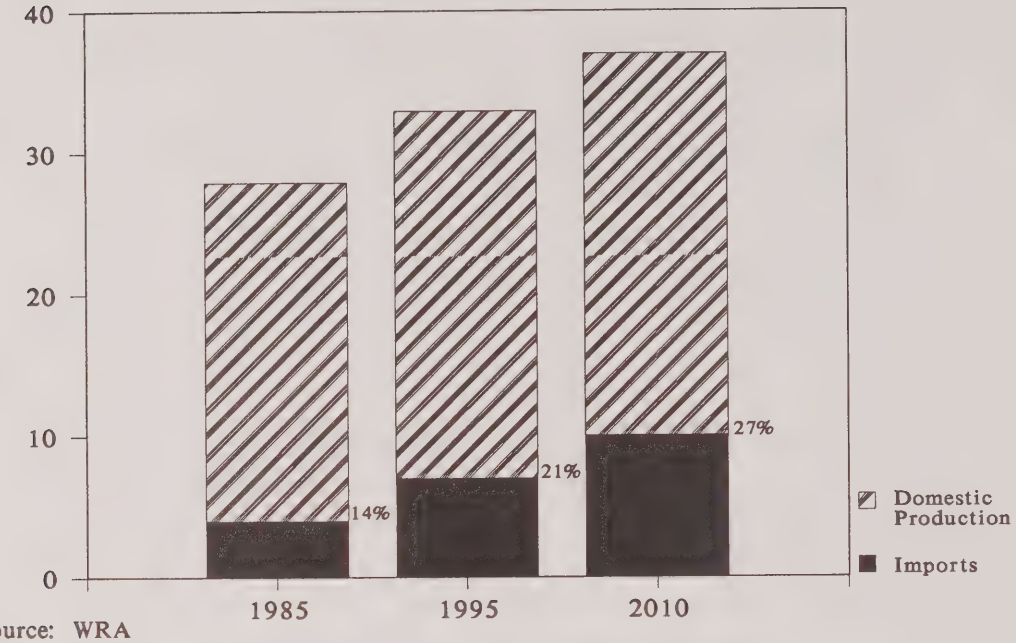
- a reduction in overall construction activity.

There are strong indications that this period of adjustment is now over and lumber consumption will show a modest increase over the medium term. This increase is unlikely to be large enough to result in a return to the high volumes evident in the 1970s for many years. Nevertheless, with an average annual growth rate of 1.5%, the increase in volume by 1995 is equivalent to an additional six million m^3 compared with the 1985 consumption level. This increase is likely to result from a reasonably strong construction sector, increasing activity in repairs and renovation, and greater use of wood in engineering designs (as opposed to traditional building practices).

Of particular interest to North American suppliers is the expected development of the platform-frame housing concept. From a relatively slow start in the late 1970s, the number of houses built with this system has expanded rapidly - reaching 35,000 units in 1986. It is widely believed that the Japanese market is becoming increasingly enthusiastic about the many advantages of the system and that the momentum of acceptance will increase. It is suggested that by 1995 the number could reach 150,000 or about 10% of housing starts. If these projections prove correct, the lumber volume could reach close to 2.5 million m^3, all in North American specifications of dimension lumber. Since it is believed unlikely that the Japanese sawmilling industry will develop a substantial production in these specifications, the majority will be imported.

Projected softwood lumber consumption levels are shown in Figure 1-10. The increasing share of imports is of great potential importance to Canada.

Figure 1-10
Softwood Lumber Consumption - Japan
(millions of cubic metres)



Source: WRA

In addition to the modest growth in consumption projected, it is believed likely that there will be significant changes in the nature of the supply to meet the demand. At present, the domestic sawmilling industry produces close to 85% of the lumber consumed in Japan. Over half of this production is now based on logs imported principally from North America and the USSR.

There is a very large number of sawmills, many of which are extremely small and produce less than 1,000 m^3 per year. The number of mills has been declining steadily since the 1960s, but the average number of employees is less than 10 per mill and the average annual production only 1,500 m^3 per year. The mills are very efficient in terms of extracting the maximum volume and value from each log, but their productivity in terms of lumber/man hour is low. With the increased value of the yen and rising wage rates in the sawmill industry, it is becoming more difficult for many of these mills to compete, particularly in the production of high-volume, standardized specifications.

It is expected, therefore, that imported lumber will represent a higher proportion of consumption by 1995. It is also possible that this trend will be accelerated by the shortage of suitable logs from the US Pacific Northwest region and/or an increase in their price. Additional availability of logs from sources such as New Zealand and Chile could offset this shortage in physical terms, but the quality of radiata pine logs is not currently accepted as a substitute for US and Canadian hemlock and Douglas fir logs for the production of much of the lumber required.

Some years ago it was believed that the production of timber in Japan would increase substantially and replace a large volume of imports. It is now felt that this increase was substantially overestimated due to the impact of a variety of environmental and exchange rate pressures. Furthermore, any additional availability is likely to be in the form of smaller-sized plantation timber which will be largely utilized by the pulp and paper industry. Consequently, there is little reason to believe that there will be any substantial increase in domestic lumber production based on local logs.

It is believed that imports of softwood lumber will increase from four million m^3 in 1985 to six million m^3 in 1995. In addition, if the development of platform-frame housing takes place as expected, imports could rise by at least a further one million m^3 after allowing for some substitution effect.

Apart from the change projected relative to building methods, there are other changes likely in the type of product imported. In the 1970s, the import of so-called 'lumber' included a substantial proportion of log substitutes such as waney cants and large timbers for remanufacture. The volumes of this type of raw material amounted to 45 to 50% of 'lumber' imports. Of the balance, about 80% was in the form of 'baby squares' (approx. 100mm x 100mm). In recent years, these shares have been changing. The large sizes for remanufacture account for less than 15%, and baby squares are less than half of the finished lumber. The greater part of the imports are now in a variety of sizes (including dimension lumber) that can be used directly or serve as components for some additional finishing process. Thus the impact of finished lumber imports on the market is now much greater than 10 years ago. In the mid-1970s, imported finished lumber (other than baby squares) accounted for less than 1% of lumber consumption. Currently, the same type of lumber represents almost 6% of the market.

It is believed that the proportion of imported lumber has the potential to grow significantly over the next 10 years. This will be affected positively by the following factors:

* it will, increasingly, be more economical to import lumber than manufacture lumber from imported logs;

* North American producers are becoming more aware of the particular Japanese specifications and more able to manufacture them properly;

* the Japanese customers are becoming more confident in the long-term consistency (quality and quantity) of foreign producers. This confidence, plus economics, offsets their traditional preference to import the raw material.

There is, therefore, a very significant opportunity for the development of substantial volumes of precision-cut, high-value components. The continued availability in Canada (at least in the medium term) of mature old-growth fibre that can yield products of the quality prized in Japan provides an excellent potential.

It should also be noted that about 15% of Japanese lumber consumption is in the form of hardwood lumber. The majority of this volume is domestically produced from the local resource and imported SE Asian logs. Over 85% of the imports come from SE Asia, but there is a continuing interest in small volumes of temperate hardwoods from North America. Additional availability of product manufactured to Japanese specifications could find a ready market. Alder is a species that could offer a good potential.

Australia

Australian sawnwood consumption in total has remained relatively static for many years. Within this total, however, there have been significant changes. Hardwood consumption, which is primarily based on domestic production, has been declining while softwood consumption has risen. Although softwood production has increased by 50% in the last 10 years, this increase has been insufficient to offset the loss in hardwood production, and imports have risen substantially - now accounting for about 30% of consumption.

The principal sources of imports are North America (60%) and New Zealand (20%) for softwood and South East Asia (20%) for a variety of hardwoods used in furniture and mill work.

Though there may be some increase in overall consumption, it is not believed that the increase will be dramatic. The principal change foreseen is a substantial growth in domestic production of softwood based on the radiata pine plantations. Australia will therefore become increasingly self-sufficient in softwood lumber, and the volume of imports will decline substantially. The principal impact of this decline will be felt by North American producers of Douglas fir in construction grades. The Australian market has traditionally been the largest offshore market for US producers of this grade and accounts for close to half of Canadian offshore exports of Douglas fir.

The increased availability of radiata pine in Australia could, potentially, result in Australia becoming an exporter of softwood lumber. It is judged, however, that even in the longer term (up to 2010), the volume of lumber exported in competition with New Zealand, Chile and traditional suppliers will be negligible.

China

The consumption of lumber (softwood and hardwood) in China is less dominated by construction than it is in most other countries. This results from firm policy by the state to limit the use of wood in construction. In 1985, of the official volume of about 20 million m^3 of lumber consumed, 47% was used in construction (half in doors and windows and the rest in concrete framing). The balance was consumed in a wide variety of uses, with packaging being the largest at 17%.

The total capacity of sawmills within the State Plan is around 25 million m^3, and it is estimated that modernization could increase this level to 30 million m^3. In addition, there is a relatively small volume of lumber imports - 300,000 m^3 in 1985.

The official policy in China is to limit lumber consumption as far as possible and to produce domestically virtually all that is needed. Both these objectives appear to be very difficult to achieve since there is very strong pressure to consume more, and the existing sawmill industry, even with modernization, does not have the required capacity.

By the year 2000, the need for lumber imports, at the most conservative estimate, could be around five million m^3 and, at a more realistic level, could be over double this volume. The major factor that will drive the actual volume of imports will be decisions by the State on whether or not foreign currency will be made available to finance the imports. The potential market need appears to exist for even greater volumes of imports since local forest resources and capacity for harvesting and processing are insufficient.

The long-term outlook to 2010 is for further increases - restricted by Government policy. The competition, however, is likely to be severe from low-cost producers such as Chile. The emphasis will be on relatively low-value construction grades of a type that can be satisfactorily manufactured from radiata pine. Thus, though the Chinese market could provide a good outlet for the lower grades of lumber that will be produced from the increasing volumes of second growth timber in BC, Canadian supplies will have to face direct competition.

An additional area of competition is the USSR. The Siberian forest resource is well placed to supply very substantial volumes to China. At present, the capacity to produce lumber is limited, but a political decision, based perhaps on a barter arrangement, could change this situation. In addition, there have recently been some major long-term contracts to supply large volumes of logs.

Taiwan

Taiwan consumes a little over one million m^3 of sawnwood annually. In the 1970s much of this was produced locally but, in recent years, domestic production has fallen dramatically. This reduction is likely to continue since labour and log costs make it increasingly inefficient for Taiwan to cut its own lumber. In addition, there is a growing realization that there is a need to preserve forests for environmental reasons. The Taiwan Forest Bureau itself will cease all logging activity and will concentrate on recreational use of forest lands plus management for bamboo and fruit harvesting.

Softwood lumber forms only a small part of consumption - 10 to 15% of the domestic harvest and under 5% of imports. It is used principally in construction with a small amount going into furniture. There is, however, a real possibility that Taiwanese furniture manufacturers will develop product lines to compete in the US pine furniture market.

The outlook for imports of both softwood and hardwood is excellent. Tariffs have been reduced, consumption is likely to increase, production from domestic logs will decline very substantially, and it will become more difficult to import logs for sawing locally. However, given the somewhat tenuous political situation of Taiwan in the long-term, it is difficult to judge whether the economy will continue to grow at the rate that currently appears possible. Nevertheless, as a geographic entity with a strong economy and the ability to compete in world markets, the need for lumber is likely to grow. Thus imports could increase from the current level of about 600,000 m^3 to well over one million m^3.

The potential for Canada will, however, be limited principally to the supply of products suitable for remanufacture (e.g. furniture) rather than in commodity construction grades. In addition to the potential for higher grades of hemlock and pine, the opportunity to develop markets for other species, such as alder, is promising.

South Korea

Korea is a large net importer of sawnwood as domestic timber generally is unsuitable for lumber production due to small size and irregular shape. Imports have risen fivefold over the 1977-1983 period. The number of sawmills at the end of 1985 dropped to 1956 from 2013 in 1984, with total processing capacity at 7.7 million m^3. The operating rate in 1985 was 54%, down slightly from 1984s rate of 56%. Major sawmills are primarily located in Inchon and Pusan, the major ports of arrival. There are reported to be about 123 log importers, 14 of which account for about 70% of total volume. Sawlogs and veneer log imports in 1985 of 5.7 million m^3 were valued at almost US$500 million. Close to 60% of the logs imported were hardwood from Southeast Asia.

The United States is the principal supplier of softwood logs, supplying about 63% of the softwood log imports in 1985. Korea also imported softwood logs from Chile and New Zealand.

Although 66% of Korea's total land area is forested, timber resources for harvest are severely limited. Local roundwood is not often used for processed lumber and panel products due to its small diameter and imperfections caused by insect attacks. Local logs are instead used for mining pit props and pulp manufacture.

Imported lumber represents a very small share of consumption and, as pointed out above, domestic production capacity is very substantial.

In earlier years, Korea had a strong tradition of using wood in housing construction. Currently, however, virtually all houses are built with concrete, brick and steel, and wood use is limited to interior decorative work and temporary supports. The housing market is substantial, at around 250,000 units per year, and there could be an excellent potential for wood frame housing - prefabricated or site built. Significant efforts have been made by North American industry and governments to encourage wood frame construction. So far these efforts have only had limited success, but the outlook still appears promising.

A strong demand exists for housing, and there is a trend away from multi-family, high-rise construction to smaller, better-quality developments. For example, the construction of row housing has increased by about 10 times in the 1980s. There is increasing evidence that the government wishes to encourage improved living standards and is interested in the burgeoning success in Japan of platform-frame housing.

The reduction in tariffs on softwood lumber from 20 to 15% a few years ago and the more recent further reduction to 5% is an indication that the government may not be willing to continue protecting the domestic sawmill industry. Production costs are high, but the mills are able to manufacture the wide variety of items needed by the market. The combination of high tariffs, plus a number of non-tariff barriers (partly a result of the trade infrastructure), historically has meant that it has been difficult for imports to be competitive. There is, however, considerable pressure - particularly from the US - to eliminate tariff and non-tariff barriers.

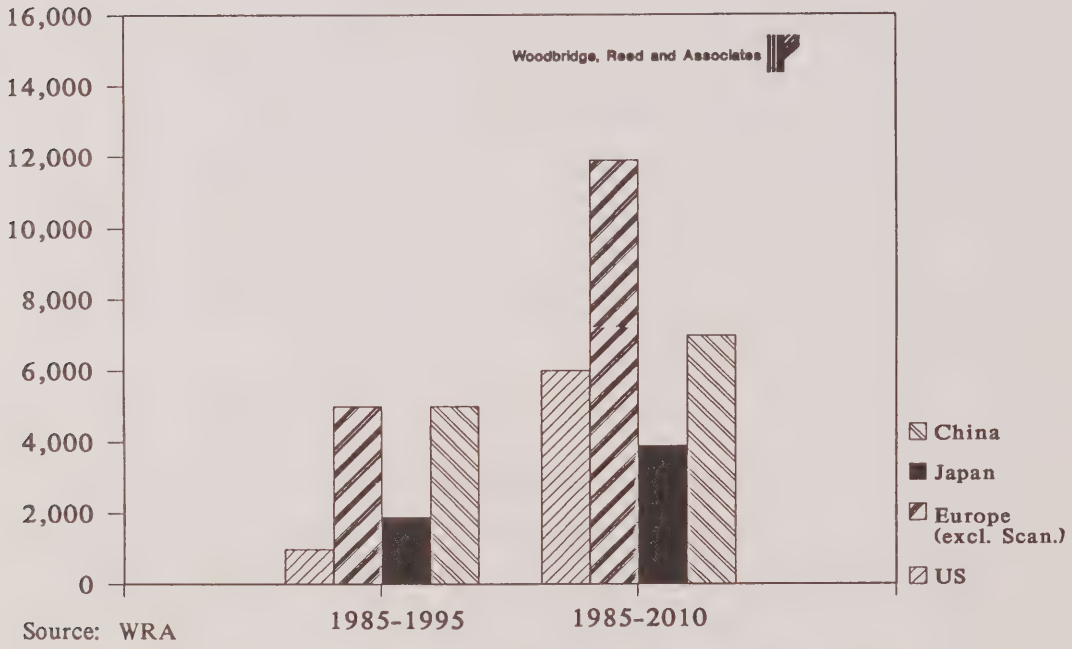
In the long term, there could be some dramatic changes. Firstly, some projections indicate that economic growth will be substantial (FAO estimates 7.5% per annum, Chase estimates 10.5). On this basis, lumber consumption could rise from three million m^3 to eight million m^3 in the year 2000 and continue to increase thereafter. Secondly, it is highly unlikely that domestic production will increase sufficiently to match demand. Thus the need for imported lumber could rise substantially from the current comparatively low level.

Assuming that the US/Canadian efforts regarding wood frame construction are successful, the outlook for construction grades of softwood lumber could be very promising. It is probable that most of the volume required would be imported. Consequently, the potential for substantial exports from Canada would appear to exist.

Competitive Position

The incremental demand for imports of softwood lumber by the major importing regions is about 15 million m^3 in the medium term (1985 to 1995) and almost 30 million m^3 in the long-term (1985 to 2010). These volumes are divided regionally as shown in Figure 1-11.

Figure 1-11
Incremental Demand for Imports of Softwood Lumber
Major Deficit Regions
(thousands of cubic metres)



Source: WRA

The countries/regions that are expected to compete to supply this incremental import demand are:

Scandinavia
USSR
Developed Oceania (mainly New Zealand)
Latin America (mainly Chile)
Canada
US.

The probable scenarios developed earlier indicate that the opportunity for Canada in the medium-term should be for increased exports equivalent to about 6.5 million m^3 (over 2.5 billion board feet) by 1995. The majority of this volume would be destined for offshore markets. It should be noted, however, that by 1987 almost half of this incremental volume had already been achieved.

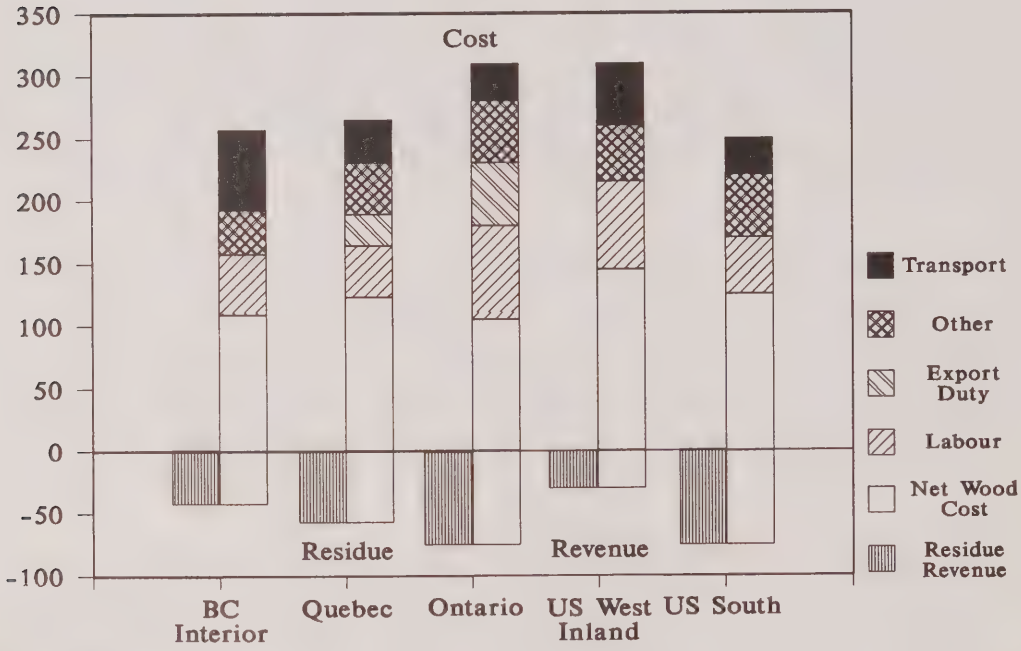
In the subsequent period (1995-2010), approximately the same incremental volume will be required and the opportunity for Canada should be around six million m^3. A significant proportion of this volume, however, could be destined for the US. Consumption growth in the US is expected to exceed production capability in this period and, though imports are expected from Latin America, there is likely to be increased demand on Canada.

It was shown earlier that, though there is worldwide trade in lumber, the trade patterns are not global in nature. Canada is essentially unique as a supplier to virtually all deficit regions. Consequently, the competitive forces that will constrain Canada's export growth vary from region to region.

US

Canada has traditionally enjoyed a 99% share of softwood lumber imports, and the major competition has been from US suppliers. Scandinavian suppliers are unlikely to become relevant except, possibly, for some very specific items, but there is considerable potential for the development of suitable manufacture in Chile. The current cost comparisons for the principal suppliers into the US market are shown in Figure 1-12.

Figure 1-12
Delivered Lumber Costs to the US
(C$/MFBM)



Source: RISI

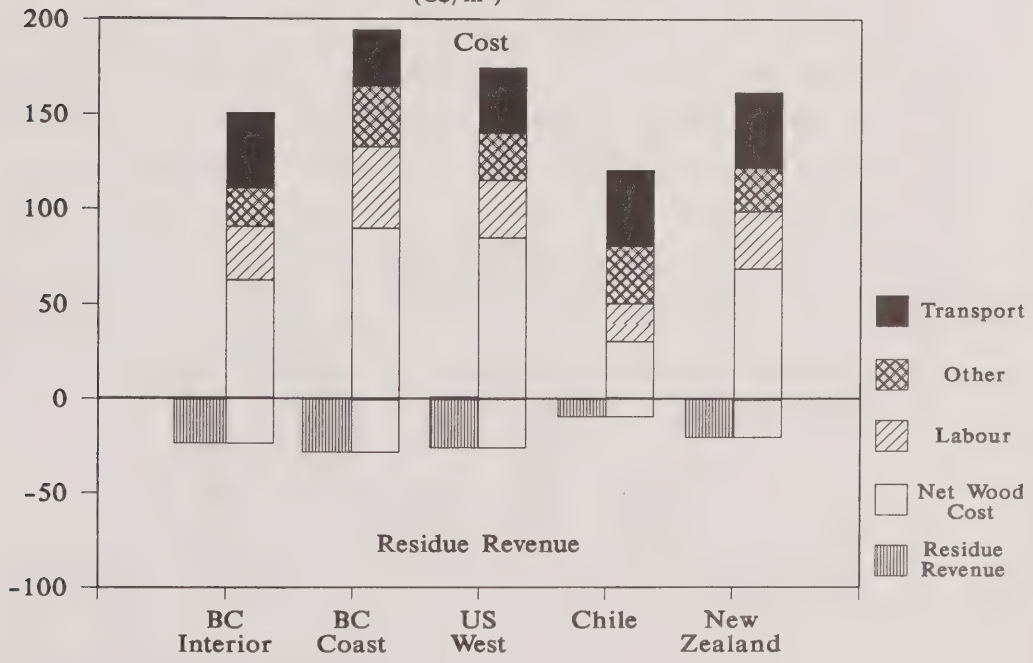
The impact of revenue from chips and other residue is of very great significance and has been highlighted in this figure. It can be seen, for example, that though the total cost of wood in lumber manufacture is much higher in Ontario than in BC, the net cost is similar. In overall terms, it is evident from Figure 1-10 that the US South, Quebec and the BC Interior are reasonably similar, but Ontario and the US West are appreciable higher. It should also be noted that costs vary significantly in each region and the levels used are averages. In Ontario, for example, there are some mills with appreciably lower costs than these shown.

It is estimated that Chilean lumber could be landed in the US South at around C$240/MFBM, which would be well below Canadian suppliers' prices in the area and very competitive with local producers.

Japan

The main competition for imports comes from US manufacturers. There is also some limited, though possibly growing, competition from USSR lumber producers, but it is not possible to develop any relevant indication of likely costs from the region. Both New Zealand and Chile are potential competitors of significance, therefore, their costs are also included in the following comparison (Figure 1-13).

Figure 1-13
Delivered Lumber Costs to Japan
(C/m^3)



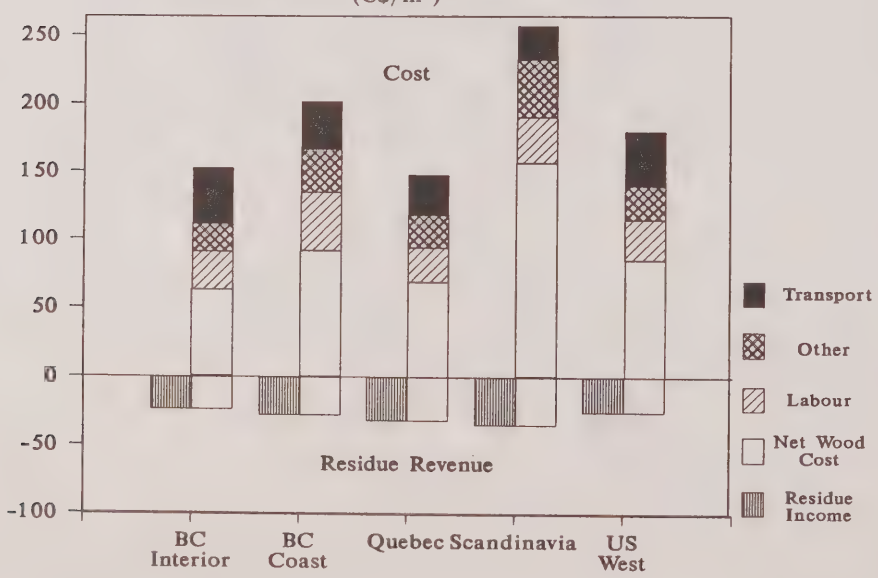
Source: RISI, WRA

The levels shown in this figure are somewhat misleading since no allowance for quality is included. The product from Chile is only accepted as low quality packaging material and therefore commands a low price in the market, whereas radiata pine from New Zealand is being accepted, in part at least, as a construction material. The production costs for the BC Coast include the cost of manufacturing a wide range of specifications for a variety of markets. An appreciable part of the production would therefore command a reasonably high value in Japan. In contrast, the US West prices are based on a typical mill producing standard North American commodity grades. The cost of all components except transport would be higher for Japanese qualities. Though no precise figures are available, it is estimated that costs in the US West for the production of similar products would be similar, if not higher, than the BC Coast levels.

Western Europe

The principal competition for imports faced by Canada in the Western European markets comes from Scandinavia. At present, due to the comparatively weak dollar, the Canadian suppliers are very competitive (Figure 1-14), but this advantage is very vulnerable to fluctuations in exchange rate.

Figure 1-14
Delivered Lumber Costs to Western Europe
(C$/m^3)



Source: RISI, WRA

The very much higher costs of Scandinavian product are very evident. The most fundamental difference is wood cost and a major reason is currency. At the exchange rate prevalent in 1985, the Scandinavian levels would be very similar to the BC Coast costs. Again, as in the discussion regarding Japan, products and qualities have an impact that is not apparent in Figure 1-14.

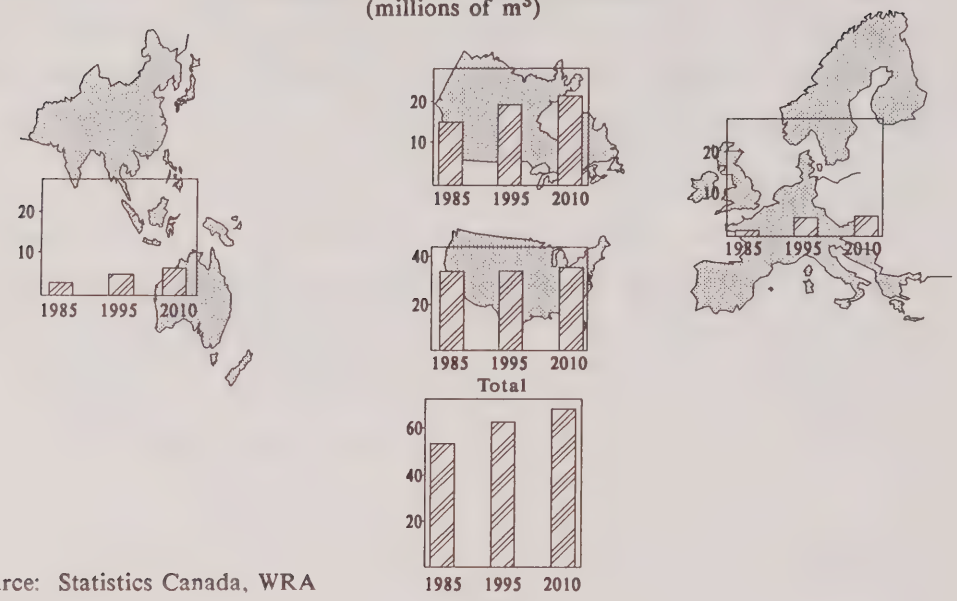
China

Though there are strong indications that China will require significant volumes of imported lumber, it appears highly likely that the focus will be on relatively low-value grades. Competition can, therefore, be expected from Chile, New Zealand and the US. The competitive cost figures are essentially those shown in Figure 1-11 earlier. In this case, however, the higher quality from the BC Coast is likely to be less important or relevant.

Overall Market Opportunity

The development opportunities for Canada, based on both the market demand analysis and the competitive position of Canadian producers are shown in Figure 1-15. In total, the growth opportunity is very significant, representing an increase of close to 30% by 2010 over 1985 levels. It should be noted, however, that by 1987 Canadian shipments had already reached close to the projections for 1995. Consequently, the potential further growth outlook is somewhat less dramatic than that indicated.

Figure 1-15
Canadian Lumber Market Opportunity
(millions of m^3)



Source: Statistics Canada, WRA

NOTE: The US and total volumes are on a different scale.

Implications for Canadian Regions

The Canadian lumber industry is very large in total but is far from homogeneous. There are substantial differences, both between regions and within regions, in the nature of the industry. Though the species available in most regions are similar, there are substantial quality differences. There is also one region - the BC Coast - where the resource is quite different from any other region.

In the sawmilling industry, these differences are fundamental to the type of product that can be produced since the manufacturing process itself is relatively simple. The nature of raw material essentially dictates what can be produced. The growth of jointing and gluing technologies has some effect but, as yet, is not very significant in total volume terms.

It is necessary, therefore, to examine the current industry base in each Canadian region before it is possible to assess the regional implications of the market opportunities that have been identified.

The costs discussed above are averages and therefore disguise some of the differences that occur, within a region, between the very large commodity producers, and the small/medium-sized mills (many of whom also produce commodity products).

General Trends

Demand in both the US and Canadian markets is projected to grow. The large mills are cost competitive and, even though commodity grades are likely to be oversupplied, these mills would be able to continue to operate at the expense of smaller, higher-cost operations. Indeed, given the apparent cost structure of a very large mill, it would be possible for new greenfield operations to be established, if transportation rates from the more remote areas (where fibre may be available) can be reduced.

The corollary of expansion (or even continuation at current levels) of the large operations is that the small and medium-sized operations are unlikely to be economically viable in commodity products when markets are poor. Clearly not all of these mills will cease to exist in prolonged downturns, and the evidence of 1981/82 demonstrated the resilience of the smaller operation. Nevertheless, the long-term trend of oversupply, declining real prices, and the low unit costs of high-volume automated mills using the latest optimization technologies, indicates that the outlook for a small producer of commodity lumber is bleak.

This outlook is common to all regions except where a very local market is sufficiently large to absorb a significant volume of the commodity production of a small mill.

The options for the small operations in any region can be summarized as follows:

* **Grow.** The resource base of two or more mills could be amalgamated and one mill expanded and modernized. Thus a single economy of scale plant can replace several uneconomic operations. Longer log hauls would be offset by lower production costs. The opportunity for this type of development is likely to exist but will be limited.

* **Specialize.** Depending on the specific nature of the resource available and its location, there are a variety of noncommodity products that offer potential. These specialty products are varied and could range from fairly straightforward products manufactured, to offshore market specifications, to precision-cut components for specific end-uses (e.g. doors, mouldings, furniture), possibly including additional processing such as finger jointing or edge gluing.

The opportunities for many specialties are constrained by the quality of the available resource. In addition, the markets tend to be small; therefore, the number of operations able to focus on any one market 'niche' must be limited. Otherwise, there will be oversupply and returns will drop. There have been a number of instances where this result has been evident. For example, in parts of the bed-frame market, the product needed can be produced relatively easily and is no longer a high value specialty since many mills are competing.

It is critical, therefore, that a mill wishing to specialize identifies a product line for which it has some particular advantage, probably resource or location, but possibly innovative technology. Another option is to invest in equipment that will ensure the mill will be a low-cost producer and therefore able to compete in the long-term. Alternatively, if the mill has strong marketing capabilities, it can keep ahead of the competition by continually finding new market niches as each market becomes oversupplied. It is this approach that has kept a number of remanufacturers in business over time.

It must be acknowledged, however, that these options are not necessarily available to all mills for a variety of reasons:

* resource or location;
* management philosophy;
* existing assets;
* capital.

* **Close.** There appears to be an inevitable trend indicating that mills which can neither merge nor specialize will be uneconomic in the long-term if they continue to produce mainly commodity lumber. It seems likely, therefore, that the next downturn in the North American market will result in the closure of some mills.

The outlook for totally new greenfield sawmills is not promising in the medium term. The productive capacity already exists to meet likely demand by 1995 - equivalent to about 10.5 million m^3 more than in 1985. This volume includes 6.5 million m^3 of incremental export plus four million m^3 incremental demand in Canada. As observed earlier, close to half the incremental export volume was already achieved by 1987. In addition, domestic consumption in 1987 is estimated to have been close to the projected level for 1995. The existing industry has therefore demonstrated its ability to produce virtually all that will be needed by 1995.

It is probable, however, that there will be continued modernization and even large-scale replacement of existing facilities with new technologies and equipment. These changes will likely result in increased capacity at the large mills which will be offset by the closure of the small/medium-sized mills unable to specialize.

Regional Implications

Though many of the factors addressed in the analysis of potential on a national basis apply to all regions, each region has specific characteristics which indicate somewhat different development opportunities.

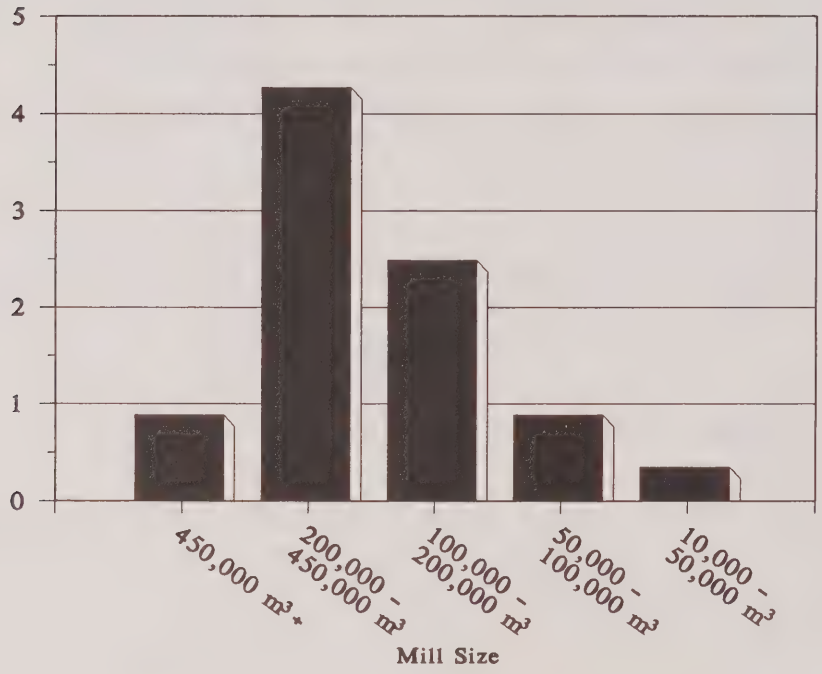
BC Coast

In 1986, coastal BC mills produced 8.9 million m^3 of lumber, representing 28% of BC's total and 16% of Canada's total. The figures for BC's production would have been even more significant had a 20-week strike not shut down much of the industry in 1986.

A total of 120 mills are reported to exist in the Statistics Canada 1985 Annual Survey, employing 10,720 production workers.

Many of these mills are very small, and an analysis of data obtained by the BC Ministry of Forests for the more significant operations indicates the size classifications shown in Figure 1-16.

Figure 1-16
Sawmill Profile - BC Coast
(millions of m^3)



Source: WRA

The majority of production is produced by the mills that manufacture over 200,000 m^3 of lumber annually.

Coastal sawmills have mainly evolved from turn-of-the-century mills sited on river estuaries to exploit the combination of river transportation of logs and ocean or rail-head shipment of lumber. Due to the large size of logs, these mills are necessarily large and typified by band saw-carriage primary breakdowns with multi-circular saw cant and board secondary breakdown. Many coastal mills are complementary to adjacent pulp and paper facilities and are undergoing major upgrading. Modernization takes the form of computer and scanner-assisted saw alignment and breakdown decision-making, coupled to precise, thin-kerfed saws and highly automated materials handling and sorting. Exemplifying a new breed of mills replacing the older operations (often on the same site), are four new $40-55 million mills--MacMillan Bloedel's Alberni and Chemainus Mills, BCFP's Hammond Mill and Crown Forest's Fraser Mills.

The timely availability of log breakdown machinery offering simultaneous improvements in lumber recovery factor, and in productivity, helps offset the rapidly escalating cost of logs delivered to these mills.

BC coastal sawmills have been characterized by having two or more parallel breakdown lines to best accommodate the wide log size variation. On the Coast, mills have to cope with small, immature logs along with overmature logs harvested as part of clear cutting. As primary growth forests diminish in significance and are replaced by more uniformly sized secondary growth forests, the sawmill machinery must also change. Secondary growth logs tend to contain less centre-rot and, combined with their more uniform sizing, lend themselves better to profile-canter style breakdown rather than the traditional band headrig carriage style. Significantly, the two newest sawmills in BC were of that profile-canter style by the West German manufacturer, Linck. An important philosophic step has been taken by these two Linck sawmill owners. Extensive log merchandising is being adopted and the input to the mills is being related to customers' needs.

The species mix for BC coastal mill lumber production is as follows for 1986:

Hem-fir[1]	52%
Western red cedar	25%
Douglas fir	15%
Yellow cedar	4%
Sitka spruce	3%
Other	1%
	100%

[1] a mixture of hemlock and true firs

During the 1970s, most of the lumber produced and sold was in the form of construction grade lumber (dimension grades for the US/Canada and "merchantable" grades for offshore markets) and the percentage of high-value clear/shop grades that was extracted was only 10/12% of the total. In recent years, however, and in spite of a decrease in the proportion of old growth timber, mills have been able to extract up to 20% in the higher grades. Some mills, with a particularly favourable log diet, have even reached 40/45% high-value material.

In addition, there is a growing recognition of the value to be generated by further processing the principal output of the primary sawmills to produce the specifications required by consumers in export markets. This further processing frequently takes place at secondary manufacturing facilities and often includes kiln drying as few of the existing primary coastal mills have modern dry kilns.

In this way, the BC coastal industry is beginning to capitalize on the unique nature of the fibre that is still available in the region. Thus, instead of merely competing in the regular construction markets which can be readily satisfied from many other sources of lower-cost fibre, the lumber from the BC coast can be specifically manufactured for uses where the demands for quality are much more stringent.

There is still substantial growth potential on the Coast, in terms of the value of the products that can be extracted from the available fibre, even though it must be acknowledged that the proportion of second growth timber is steadily increasing. It must also be noted that there is effectively no growth potential resulting from increased log harvest. In fact, the overall coastal harvest is likely to decline, and there will be a drop in the proportion of saw-log-quality timber (even including second growth). Consequently, the future development of the BC coastal lumber industry cannot depend on volume growth and must focus on value growth.

By market area BC coastal lumber production was shipped as follows in 1986:

Domestic	29%
US	39%
Offshore export	32%

Of the offshore export markets the most important market by far is Japan, which accounts for about 55%. This market alone absorbs close to 80% of the sitka spruce and yellow cedar produced in coastal BC, and 25% and 10% respectively of the hem-fir and Douglas fir production. The next most important area is the EEC with about 30% of offshore shipments. The principal species are hemlock and Douglas fir with a relatively small volume of western red cedar (about 10% of shipment to the EEC). The Australian market has been a traditional market for Douglas fir and cedar from the coast for many years and accounts for a little under 10% of offshore exports from the BC coastal mills. The only other market of real significance has been China. Shipments have been somewhat sporadic and, since the commencement of exports in 1982, have varied substantially. In 1986 and 1987, China has accounted for less than 3% of offshore shipments.

It is worth noting, however, that though there is considerable emphasis on the importance of offshore markets to the BC coastal industry, in reality, as indicated by the figures shown earlier, two-thirds of the coastal production is shipped within North America. The dramatic increases in offshore export in 1987 have altered this proportion to some extent.

There are important differences in the relative significance of the various species as shown in Table 1-3.

Table 1-3
Share of Production Exported Offshore

Douglas fir	35-40%
Western red cedar	10%
Yellow cedar	80-85%
Hem-fir	45-50%
Sitka spruce	75-80%

Whereas the offshore markets take most of the coastal production of yellow cedar and sitka spruce, the other species that is almost unique to BC, i.e., western red cedar, is heavily dependent on the North American market for sales.

The US market, which in 1986, received about 40% of the coastal production, has traditionally been heavy to hem-fir and western red cedar. Though there are significant volumes shipped by road to Washington and Oregon, the majority of the coastal production to the US is shipped by water and is in the form of green dimension specifications.

Growth opportunities on the Coast, assuming a greater emphasis on products other than commodity construction lumber for North America, are very significant but will be constrained by the availability of suitable fibre - in terms of species and quality. The Japanese and European market demand for the type of products and components that can be extracted from the fibre available is projected to be strong in both the medium and long term.

The availability of the major species - hemlock - will include an increasing proportion of second growth. There will, however, still be a very substantial volume of old growth - certainly in the medium term but even in the period up to 2010.

In addition, the second growth fibre is also of good quality when compared with the fast-growing plantation wood that will be the competition.

The total volume of fibre processed on the Coast is not expected to increase and may even be somewhat lower than in recent years. Therefore, it is unlikely that there will be any new mills, other than replacement of existing operations. It is projected, however, that there will be a substantial increase in processing activity in order to develop the products that are required in the markets. In addition, it is expected that improved technology will result in better utilization of the input fibre. Consequently, the volume of lumber and solid wood products produced can increase even though the volume of logs into the mills will remain static at best.

The changes required in the nature of processing activity are well appreciated by the coastal industry. Though there are no official statistics available that differentiate standard commodity lumber from special products, a study undertaken several years ago[1] indicated that the volume of lumber further processed by remanufacturers in BC was in excess of 500 million board feet. The initial findings of a study due for release some time in 1988, indicate that the total volume is now over two billion board feet. Though the definition of 'special products' may be somewhat broader in this latter study, it is evident that there is already much greater focus on producing products that take advantage of the potentially valuable characteristics of coastal fibre.

In addition, it is believed likely that a major promotional effort, initially mainly funded by government, will be launched to develop markets for further processed lumber. This effort will not only have a strong market orientation but will also develop a strong quality controlled supply base including an improved synergistic relationship between the primary mills and the further processors.

The product profile of BC coastal mills is therefore expected to change significantly both in the medium and long term. The output of currently standard commodity product manufactured to North American specifications will be limited and the majority will be in offshore specifications, plus higher value items for the North American markets.

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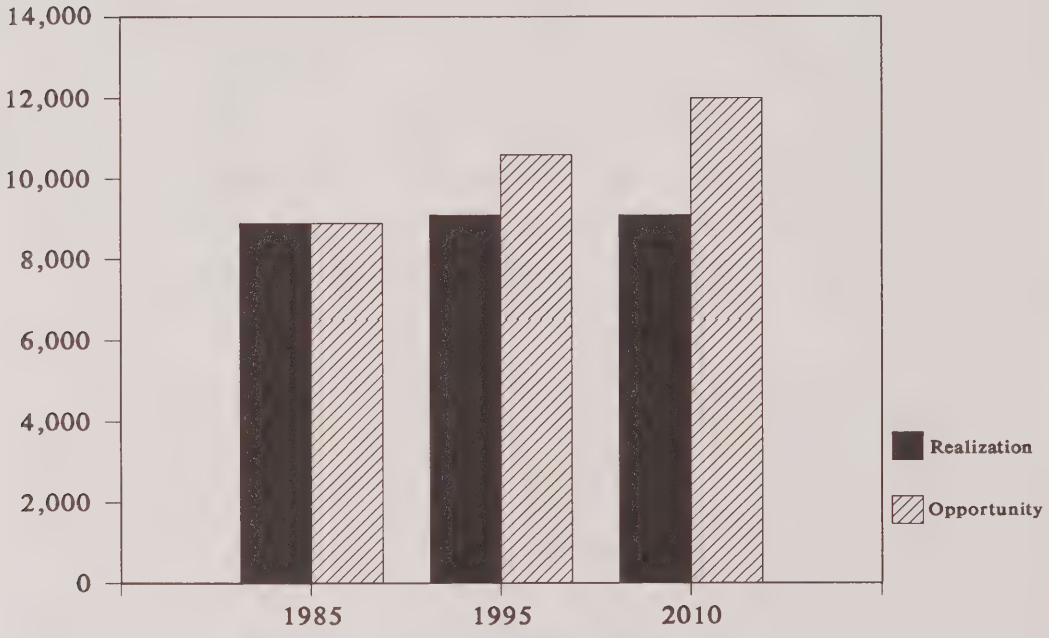
[1] Secondary Manufactured Solid Wood Products in BC - Woodbridge, Reed and Associates, 1984.

The market opportunities for lumber in a variety of forms from Coastal BC is substantial. However, on the basis of the fibre that is likely to be available, it seems unlikely that these opportunities can be realized. In volume terms, the probable scenario (Figure 1-17) indicates that production will remain relatively static. The major opportunity will be in the development of consumer oriented products that can command higher values.

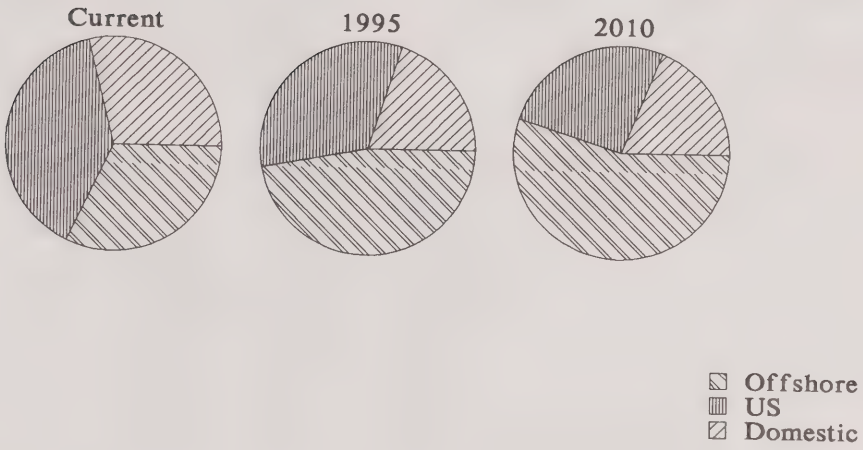
Figure 1-17
BC Coast Lumber Market Demand
Opportunity vs Realization
(thousands of m^3)



Source: WRA

As a result, it is expected that the market mix for BC Coastal lumber production will show a gradual shift towards offshore shipments as shown in Figure 1-18.

Figure 1-18
Lumber Distribution - BC Coast
%



Source: WRA

It is important to note, however, that this shift cannot take place without significant capital investment in secondary processing. Indeed, current pressures from offshore markets (such as new Eurocode recommendations) indicate that even to maintain sales of standard construction grades may necessitate investment in kiln capacity. Green lumber is less and less acceptable partly as a result of highly publicized issues such as 'nematodes' and toxic anti-stain treatment and partly because the consumers prefer seasoned lumber. Kiln drying will, therefore, become increasingly necessary, not only as part of secondary processing of higher value products but also for the standard grades.

The structure for the BC Coast has been discussed, so far, entirely in terms of softwood. There is also, however, a small hardwood resource - mainly alder - which has received little attention from industry. Various small operations have commenced and failed with alder, yet the lumber that can be extracted is of excellent quality. A major problem has been that many of the logs have a significant proportion of defect; therefore, the volume of quality lumber that can be produced is only 20-25% of the input volume. In the State of Washington, alder mills are reasonably successful and have economic outlets for residue.

It is believed that there is an untapped potential in the BC alder resource and that there is an opportunity for development that will occur in the medium-term. Japanese demand for alder, both in the form of lumber and chips is excellent, and a number of companies are currently investigating the possibility of processing this unutilized species.

BC Interior

In 1986, Interior BC mills produced 22.6 million m^3 of lumber, representing 72% of BC's total and 41% of Canada's total.

A total of 229 mills are reported to exist in the Interior by Statistics Canada's 1985 Annual Survey. Interior sawmills and planing mills employed 18,285 workers in 1985.

Interior mills are typified by modern, high-volume, throughput softwood S-P-F dimension mills and generally represent the latest in production technology.

Many of these mills produce 500-600 thousand board feet per eight hour shift and lead the world in their class.

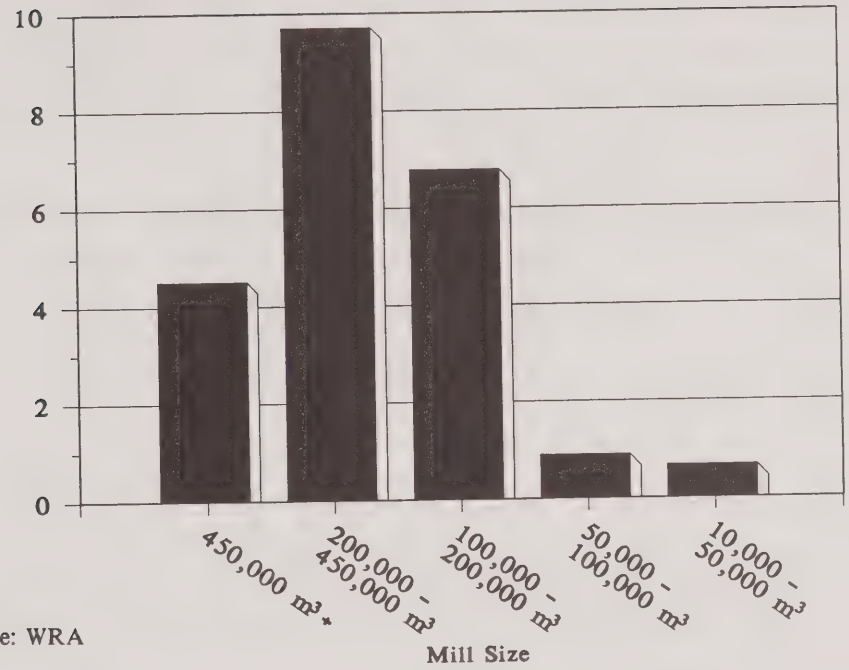
As an example of mill scale, one BC interior mill, Rustad-Prince George, in 1986 produced 220 million board feet which compares to:

- Nova Scotia 225 million board feet (hard and softwood) 1986
- Manitoba 104 "
- Saskatchewan 169 "

Since 1986, Rustad has added a new chip-n-saw line!

Of the total 229 mills reported by Statistics Canada, about half can be regarded as significant and are broken down by size as shown in Figure 1-19.

Figure 1-19
Sawmill Profile - BC Interior
(millions of m^3)



Source: WRA

The very large 'super mills' account for 20% of production. In world terms, the next size category of mills must also be regarded as extremely large and they account for over 40% of production in the BC Interior.

BC Interior 'super mills' are typified by exceptionally low processing costs, achieved by combinations of equipment and evolving technology permitting high-volume throughput and high lumber recovery factors, while employing the least labour currently possible. Some mills can achieve over 1000 m^3 per shift with little more than 20 production personnel.

Volume recovery is maximized by the use of electronic scanning and computer-assisted sawing machinery. Virtually every breakdown decision, from log length bucking via primary and secondary breakdown, through to trimming, are computer optimized, at high speed, to ensure a minimum of wasted or undesired product. Quality control routines continually monitor actual sizes produced, further reducing waste.

High productivity (low manpower per unit of production) is achieved by fast and uninterrupted processing speed, a minimum of human intervention and decision-making, multiple parallel processing lines and highly automated conveying, handling and control systems. An example of such automation permitting high productivity would be at the sorter-stacker, where one operator now replaces a green chain formerly crewed by 15-30 men.

The manufacturing costs at these large mills are significantly lower than at mills in almost all parts of the world. At the same time, however, the high throughput, low unit costs and high labour productivity are achieved at the expense of value and volume extraction from the input raw material. Thus, in world terms, the amount of the log converted to lumber is comparatively low, and the ability to produce other than a limited range of construction grades is restricted.

The residue, in the form of chips, resulting from the sawmilling conversion process provides the great majority of the raw material input to the BC pulp industry. Some part of the planer shavings and sawdust is also used by the pulp industry, but the majority, together with hog fuel, is burnt. In some instances, about 30 to 40%, these residues are burnt to provide heat in various forms, but the majority is wasted.

The Interior also has a considerable number of "bush"-scale mills which support other rural economies, such as agriculture, trapping, or even logging for larger operations, but their combined output is less than any one major mill.

The species logged in the Interior of BC is heavily weighted to spruce and lodgepole pine as is evident from the breakdown shown in Table 1-4.

Table 1-4
Log Production by Species - BC Interior 1986

	%
Lodgepole pine	36
Spruce	34
True firs	11
Douglas fir	9
Hemlock	5
Cedar	3
Larch	1
Other	1
Total	**100**

Source: Ministry of Forests

With few exceptions, the lumber produced from lodgepole pine, spruce and the true firs is combined and classified as a single species group known as S-P-F (Spruce-Pine-Fir) which accounted, in 1986, for 86% of BC Interior lumber production. Douglas fir is combined with larch and represented 7% of production in 1986. The balance of production was cedar and hemlock, produced mainly in the southern Interior region (the Columbia Wet Belt).

The great majority of the production from BC Interior mills is in the form of construction lumber in nominal 2" (and some 1") thicknesses by widths of 4", 6", 8", 10" and 12". These products are kiln dried and planed to North American specifications.

Shipments within North America typically account for a very high proportion of the sales of BC Interior lumber, as follows:

		% of Shipments
to	Canada	32
	US	63
	offshore export	5

In addition, due to the reload distribution system, a substantial part of the shipments shown by Statistics Canada as going to Canada was subsequently redistributed to the US. In reality, therefore, the US proportion is probably about 75%, while Canadian consumption only accounts for 20%, half of which is consumed within BC itself.

The offshore export proportion increased significantly in 1987 to close to 10%. The bulk of this share was shipped to the UK (60%) and Japan (30%). However, most of the product to Japan, and up to a quarter of the UK shipments, is in North American specifications. Consequently, it is clear that the volume of production of specifications other than standard North American grades and sizes is still very minimal.

Growth opportunities for the BC Interior lie in two very different directions. In overall terms, there is unlikely to be any substantial increase in the availability of softwood fibre. The options available are essentially:

* produce commodity grades even more competitively and improve yields further;
* develop other grades and specifications that capitalize on the unique characteristics of the available fibre.

The outlook for commodity grades into both Canada and US is reasonably strong and represents a very large volume. The main direction of the majority of investment must, therefore, continue to be related to commodity grades. The large BC Interior mills have a distinct manufacturing cost advantage and are expected to continue to invest in order to maintain their position. Recent increases in wood cost, due to higher stumpage and forest renewal costs, have had a significant impact on mills in some areas. It is far from clear at present how these operations will adjust to the new circumstances. Their comparative ranking, in terms of competitive cost, has been dramatically changed. This change is primarily related to higher costs on high quality fibre, and they will have to assess the possibility of processing the larger logs for other than commodity grades.

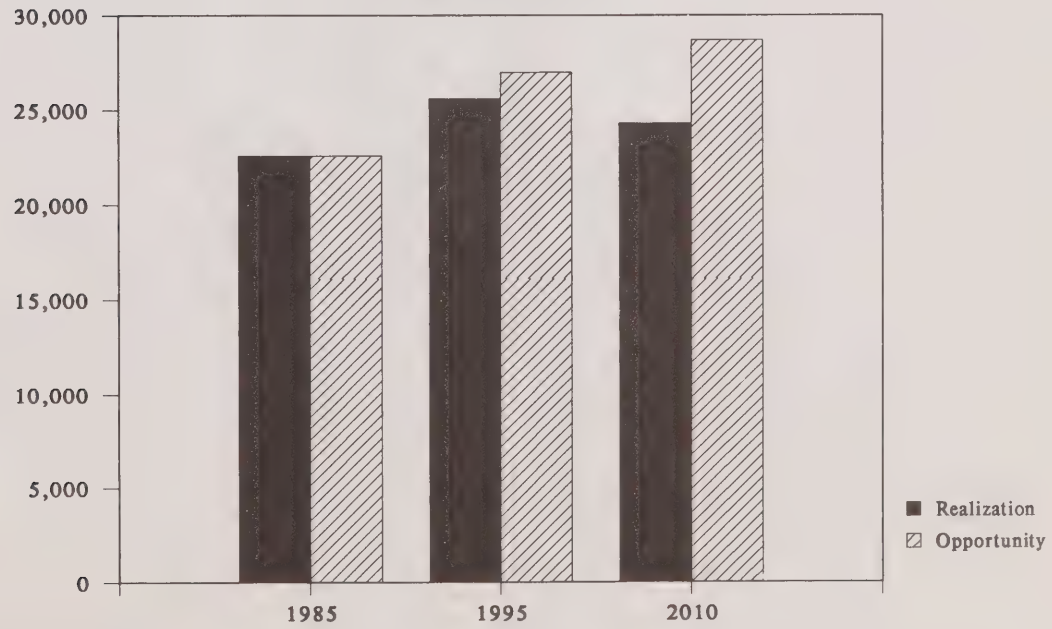
Though most of the production is by the large mills, there is also some volume manufactured by smaller operations. While markets are strong, many of these companies can still operate profitably - even producing commodity grades. In weak markets, however, they have to face strong price competition from the large operations with lower costs. It is these mills that will need to develop product lines that can be differentiated from the normal commodity goods.

Both western white spruce and lodgepole pine, which together account for 70% of the resource, have characteristics that are suitable for a variety of markets and end-uses. The specifications are different from those of commodity products, and it is often difficult to manufacture a variety of sizes if the main focus of production is on commodity. Large mills must avoid production changes that adversely affect the cost of manufacturing the main product. Thus the comparative disadvantage of small mills in the context of commodity production becomes an advantage for other product lines.

These mills will be able to segregate species and start to develop new product lines, possibly in combination with a further processing effort, as discussed earlier relative to the Coast.

It appears that the market opportunities available to both the "super mills" and the specialty mills are greater than what is currently recognized as likely to be available in terms of sawlog quality fibre. As a result, the outlook for softwood lumber in the BC Interior, shown in Figure 1-20, is for some decline (bearing in mind that 1987 production was over 26 million m^3).

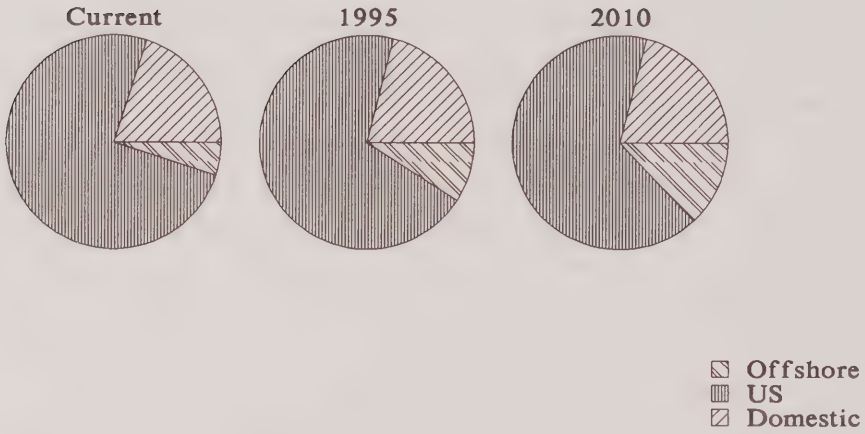
Figure 1-20
BC Interior Lumber Market Demand
Opportunity vs Realization
(thousands of m^3)



Source: WRA

It is estimated that there will be some small shifts in the geographic distribution of sales as a result of a continued development of offshore sales. However, as can be seen from Figure 1-21, the major market will continue to be the US.

Figure 1-21
Lumber Distribution - BC Interior
(%)



Source: WRA

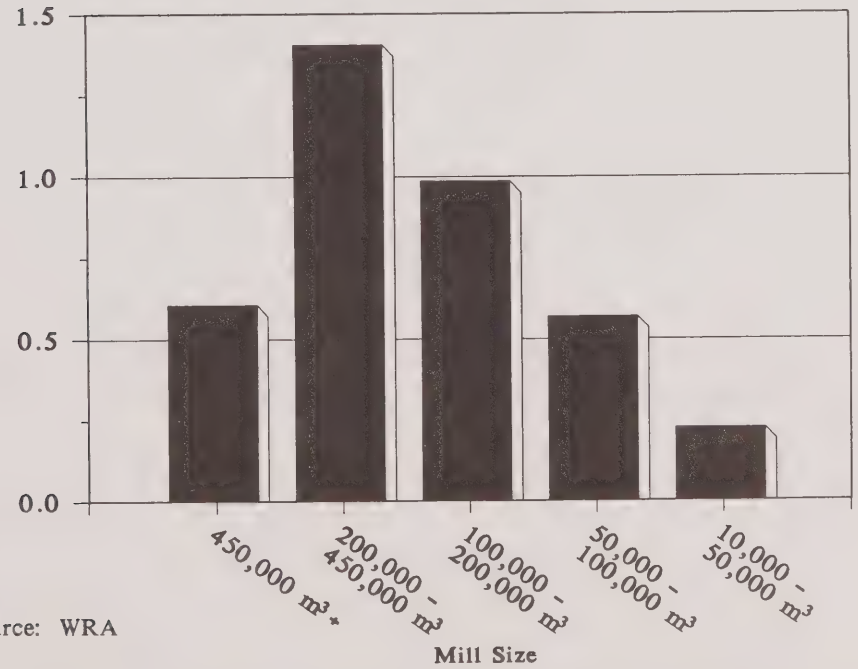
The increasing harvest of aspen could lead to some small, very specific, opportunities. It is believed that there are some areas where aspen with a comparatively low proportion of decay can be found. It is possible, therefore, that there may be some minor opportunities for the development of aspen specialty lumber opportunities, possibly in combination with a larger user of aspen. In addition, there are some small pockets of birch which could support minor specialty operations. Otherwise, there appear to be few prospects for the development of hardwood lumber in the BC Interior.

Prairies

The Prairie provinces in 1986 produced 3.8 million m^3 of lumber or 7% of Canada's total. Though dwarfed in scale by other provinces, the Prairie forest industry provides a major source of support and stability for many communities and is a vital supplement to an agricultural - hence highly seasonal - economy.

A total of 73 sawmills are reported in Statistics Canada's Annual Survey and these mills employed 3,450 workers in 1985. However, according to specific surveys undertaken in each province, the number of operations is considerably higher - at over 800. Most of these mills, though, are very small and produce less than 10,000 m^3 per year. Only 35 mills are above this size and their volumes of production are shown in Figure 1-22.

Figure 1-22
Sawmill Profile - Prairies
(millions of m^3)



Source: WRA

Alberta is by far the most important producer of lumber within the Prairie region, accounting for 85% of production.

Furthermore, there are mills in Alberta which are of the type found in the BC Interior, i.e., highly efficient, high volume and low cost, which produce more than three quarters of the total Alberta volume. For these mills, the comments describing the BC Interior industry are appropriate.

For most of the balance of the industry in the Prairie region, however, the situation is significantly different.

The forested area of the Prairies forms a swath from Central Alberta to Southern Manitoba, defining the location of the sawmills. The limited size of mature trees, particularly in Saskatchewan and Manitoba, and the limited North-South transportation routes have resulted in sawmills of medium to small size being set up. The mills are polarized between medium-scale operations sited in communities having rail or road transportation, and very small operations, generally family owned and operated.

The small number of pulp and paper facilities, and extremely long hauling distances, result in reduced mill net returns for residues. This is a fundamental limitation to growth of scale of Prairie sawmills.

Limited log size and very many small forest quotas makes it uneconomic for individuals to invest in modern facilities, or to employ scanning and volume optimising equipment and precision, thin-kerf sawing machinery.

Few locations exist which would permit the amalgamation of several quotas into a cooperatively owned and operated facility which may have the chance of benefitting from economies of scale.

Typical medium-sized sawmills consist of a circle or band-carriage, large line primary breakdown with either two-saw scragg or chipper-canter, small-line primary breakdown. The combined flows are further processed through manually-aligned rotary cant-gang and board edgers, often with merry-go-rounds and pocket chipping edgers permitting recovery of side and jacket boards to produce, say, 1 by 4 and 2 by 3. Smaller mills tend to be either portable tractor-powered scraggs or circle-saw carriage mills. The thick-kerf saws, employed for stability and to survive the impact of rough service, limit the lumber recovery factor possible from such operations. These mills rely heavily on the skill of the operators to best align the logs to the cutting planes of the saws.

Any misalignment, however, incurs significant penalties in terms of optimising lumber recovered, which is especially critical on marginally small-diameter logs. Maintaining sawing accuracy and acceptable surface finish with older bush-mills is a major factor cited in the failure of many bush mills. As costs associated with the delivery of logs to these mills and in transporting lumber to market increases, the need to extract the maximum of saleable product increases simultaneously. Without a sufficient and economic log supply at a location, the cost of efficient conversion facilities cannot be justified.

Major companies, or cooperatives of smaller operators, are largely unable to effectively package a viable operation without some outside assistance. In areas where pulp mills exist, the benefits of having an outlet for sawmill chips tend to be offset by the competition for logs. Further, the union wage scales offered by pulp mills tend to distort regional expectations that cannot be met by the sawmill sector.

Alberta, unlike Saskatchewan or Manitoba, still has available unutilized forest resource to offer to new investors. Major areas of uncommitted timber still exist on the Peace, Athabasca and North Saskatchewan River systems. A perceived limitation of the advancement of Alberta's forest industry is the lack of transportation facilities from forest to mill and from mill to marketplace. In some locations, new rail spur lines would be required. Intermodal and interrailroad reload yards will be needed to reduce rail costs.

The cost of transportation of raw material to mills, and finished products to markets, also limits the opportunity for capital expansion. Unallocated resource is generally in the far northern portion of these provinces which is further removed from the end-user, including local farming and construction markets, on which some small operators presently rely.

Apart from a very limited amount of aspen being sawn by some small mills, the lumber produced is virtually all S-P-F. North American dimension grades and sizes dominate the output - particularly from the large Alberta mills.

Statistics Canada data for lumber shipments by destination are somewhat suspect, particularly for Alberta. On the basis of discussions with industry, it would appear that the distributions are as follows:

Canada	25%
US	75%
offshore	negligible

Of the volumes shipped to Canada, a high proportion would be consumed locally within reasonable proximity to the mills. The principal exception to this statement would be the wider widths of construction lumber produced by the Alberta mills with access to large spruce logs. These larger sizes are also shipped to the Ontario and Quebec markets.

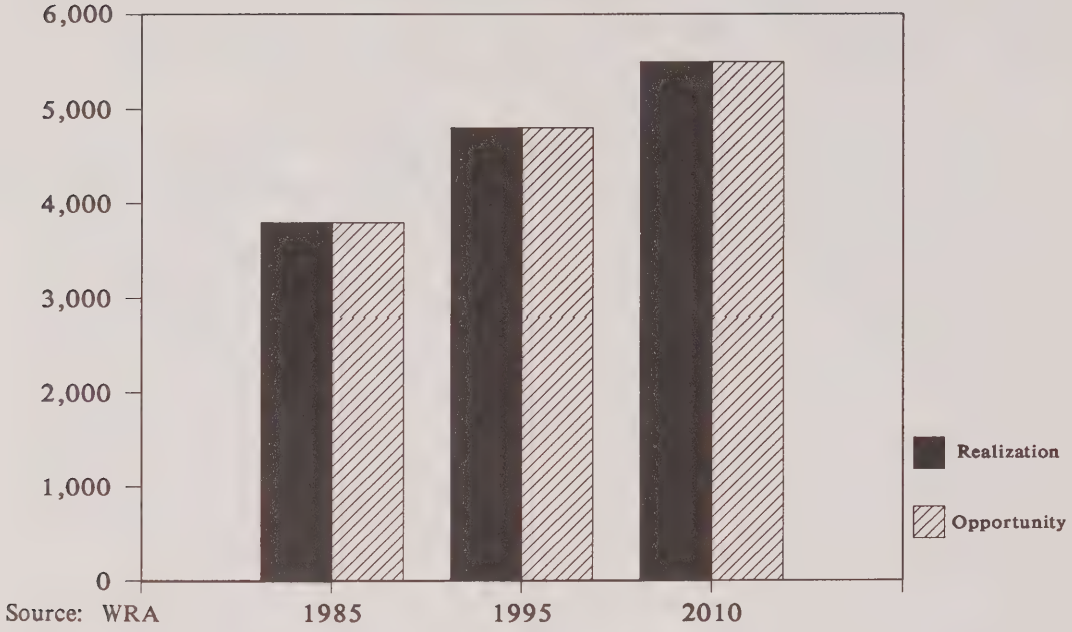
Only a little over 50% of the shipments to the US are by rail, and there is a substantial volume moving by road. Half these road shipments are to Illinois, Indiana, Minnesota, and Wisconsin, but the balance is distributed throughout the US. This distribution pattern has largely resulted from the less-than-favourable rates offered on rail freight to the Prairie producers. It is possible that deregulation could benefit lumber mills in this region.

Except for parts of Alberta, the opportunity for growth of lumber production in the Prairies is unlikely to be significant. The very small operations will likely continue to operate based on local needs, but it is felt that the small/medium-sized facilities will come under increasing competitive pressure. Their major problems are:

- scale of plant is too small to justify investment in technology that can reduce costs;
- availability of additional economic fibre is limited;
- the quality of fibre is far from outstanding;
- economic access to markets for specialty products is limited.

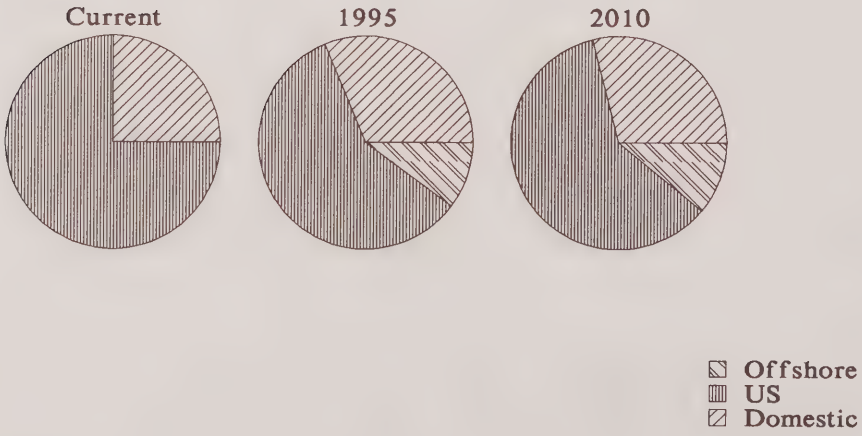
In Alberta, however, there are some promising opportunities for growth and fibre still exists to support expansion. It is evident, therefore, from Figure 1-23 that the market opportunity can be realized. Given the difficulties that appear likely in other regions to realize the market opportunities, it is possible that the growth in Alberta could be greater than that shown. Already a number of very large plants will be able to continue to compete in the commodity market. In addition, there are areas where good quality fibre would provide suitable raw material for specialty products. Though Alberta is less favourably located than the BC Interior for offshore markets, the additional costs should not prove a fundamental constraint. A number of Alberta operations are expected to develop in this direction. The total volumes are unlikely to be very substantial and the major markets will continue to be the US and Canada (Figure 1-24).

Figure 1-23
Prairie Lumber Market Demand
Opportunity vs Realization
(thousands of m^3)



Source: WRA

Figure 1-24
Lumber Distribution - Prairies
(%)



Source: WRA

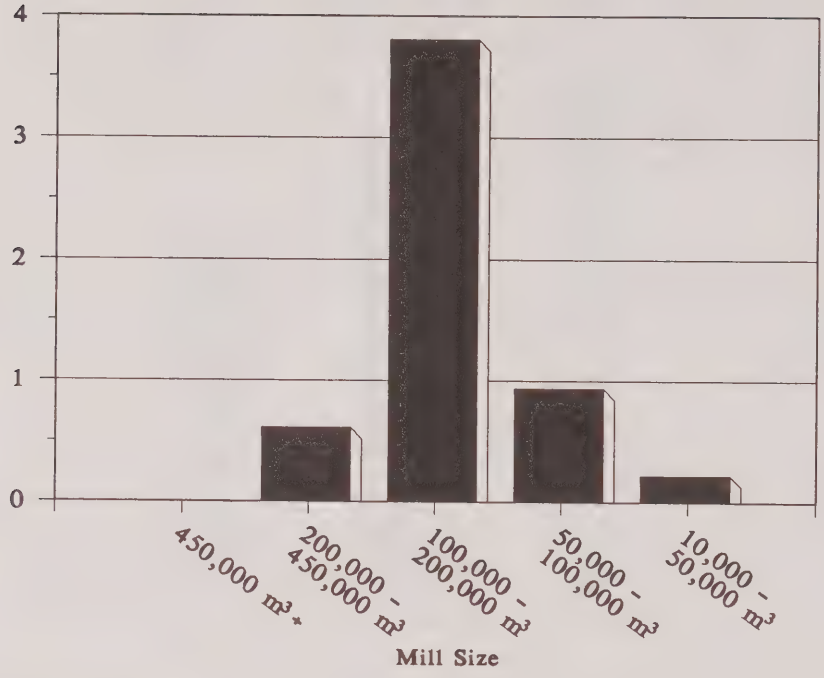
There are very significant volumes of unutilized aspen throughout the Prairies. The potential for growth in hardwood lumber is likely, however, to be limited to particular areas where a supply of relatively defect-free aspen is available or where a satellite plant to a major aspen user can be established. In addition, there may be the opportunity for a few small, highly specialized operations on the lines of some of the well-publicized companies that already exist.

Ontario

In 1986, Ontario produced 5.6 million m^3 of lumber (5.2 million m^3 in softwood) representing 10% of Canada's total, and 0.4 million m^3 of hardwood, almost half of Canada's total.

The data available from Statistics Canada indicates that, in 1985, there were 212 mills employing 7,680 workers. The Ontario Forest Industry statistical report published by the Ontario government states, however, that the total number of licensed operations was 733 in 1985 and 725 in 1984. Though a significant number of the operators may be licensed but not operating, it is probable that the Statistics Canada figures are understated. Of this total number of mills, a very large proportion are extremely small and produce much less than 10,000 m^3 of lumber annually. It is probable that the combined production of the mills other than those analyzed in Figure 1-25 is less than 5% of Ontario's lumber production.

Figure 1-25
Sawmill Profile - Ontario
(millions of m^3)



Source: WRA

The majority of the lumber is produced by sawmills that qualify as small to medium-sized in the context of Canadian producers.

Many of the larger (in the Ontario context) mills have two or more parallel breakdown lines, typically chip-n-saws, chipper cants or two-saw scraggs for most of the production and circle or hard carriages headings for the larger logs. The level of computer optimization at most of the work centres in the mills is relatively low, and there has only been a limited amount of capital investment in recent years. Many of the mills are part of integrated operations where their importance as suppliers of raw material to nearby pulp operations is often paramount. Scarce company capital resources have tended to be directed to the more profitable pulp/paper operations.

The production of the Ontario sawmills is split between softwood and hardwood. The majority is softwood lumber, of which 86% is S-P-F, and most of the balance is red and white pine. Hardwood lumber is in a variety of species as follows:

Species	Percent of Hardwood Lumber Production
Birch	12
Oak	8
Maple	40
Poplar	15
Other specified hardwoods	14
Mixed hardwoods	11
Total	**100**

Almost all of the S-P-F is produced to North American dimensions and, due to the resource limitations, most is in 2x4 and 2x6 sizes. Many of the mills are restricted to 16' lengths and none at this time produces MSR lumber. All the major mills sell kiln dried products, but there are still some smaller operations selling green lumber--mainly locally. The mills which segregate and process separately the red and white pine tend to concentrate on the production of boards and specialty products, since these species command a significantly higher value.

The types of product produced by the manufacturing of hardwood lumber vary substantially from high-value specifications, such as oak for furniture, or maple for flooring, to low-value items such as packaging, and dunnage from poplar and mixed hardwoods.

According to Statistics Canada data on shipments, about half of the lumber volume is shipped to points in Canada and the balance is exported. Contacts with the major companies indicate that a much higher percentage of their product is shipped to the US - up to 90% in some instances. There are two possible reasons for this apparent discrepancy:

* Some volumes may be recorded as local shipment to a domestic wholesaler and subsequently exported;

* the large companies, with high throughputs, concentrate on the US and are very competitive. In contrast, the smaller operations, whose costs are higher, emphasize sales with the local markets.

Since much of the production in Ontario comes from smaller companies, an overall 50/50 split domestic/export could be reasonably valid.

Of the volumes recorded as exported, there are some small volumes of hardwood and minimal volumes of softwoods (12,000 m^3) exported offshore. The great majority--in excess of 95% - is shipped to the US. The statistics for method of shipment are substantially influenced by the volume of product that is moved through reload centres. According to these figures, only 10% of shipments from Ontario to the US move by rail. It is believed, however, that the proportion of rail shipments of Ontario production is closer to 25%. Even with this higher figure, it is evident that road shipment is of major importance.

The volume of shipment to the neighbouring states of Michigan, Ohio, Pennsylvania and New York accounts for close to 70% of road shipments of lumber from Ontario. Even though some of these shipments originated from BC/Alberta, it is clear that Ontario lumber producers are vulnerable to activity in a relatively small region of the US.

Ontario is a large consumer of lumber and requires more lumber than can be produced in the province. Consequently, since it can be expected that Ontario would share in the overall growth of Canadian consumption, the outlook for growth in the volume of lumber consumed in Ontario should be promising.

The factors that affect the growth potential for Ontario are essentially those that were described earlier for Canada overall. Ontario mills are well placed, geographically, to develop special products that can fit into a number of market niches, both in the domestic market and the neighbouring large population centres in the US. Exports to Europe are also a possibility, though there are transportation disadvantages for many mills relative to Quebec producers.

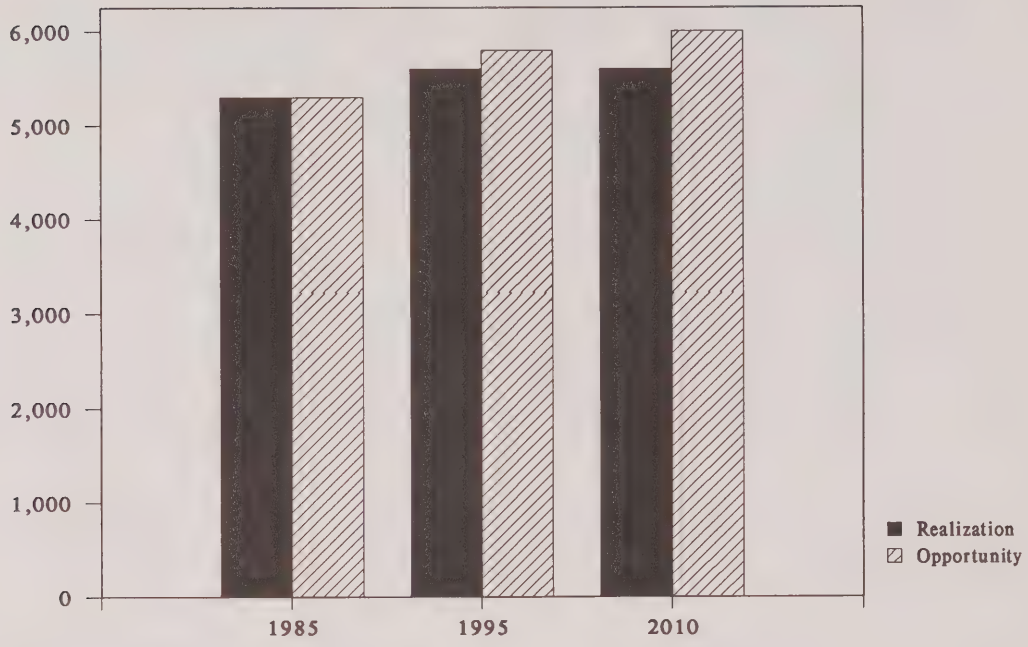
There are, however, some problems that must be overcome. As was shown earlier, the profile of the industry indicates that a substantial proportion of production comes from small mills. These mills often do not have the ability or production volume to invest in the latest technologies and their production costs are high. Consequently, in spite of the transportation disadvantages, the large commodity producers in the West offer strong competition in the Ontario market. Though much of these sales are in widths and sizes that cannot easily be produced from the Ontario resource, there are also the smaller specifications being shipped from the West.

There is a need, therefore, for some changes in the existing industry.

* a few mills already enjoy a reasonable economy of scale but need continual investment in upgrading if they are to remain competitive in commodity grades;
* some rationalization may be needed to better allocate resources to individual large-scale mills;
* many of the mills need technological improvement if they are to become competitive. These improvements should be aimed either at lower-cost commodity production or at higher-value specialty product manufacture.

As was pointed out earlier, there is growth potential based on market opportunities. However, even though the resource analysis indicates that surplus softwood fibre exists, it appears questionable whether the lumber production would increase. The quality and location of the additional fibre and the need for the fibre to satisfy more profitable uses in the pulp industry suggest a static outlook, in volume terms, for lumber. The relationship between demand based on opportunity and realization are shown in Figure 1-26. Even to maintain this static situation, the changes discussed earlier will need to be implemented. The development potential would, therefore, be focused on improved profitability and higher-value products rather than on volume.

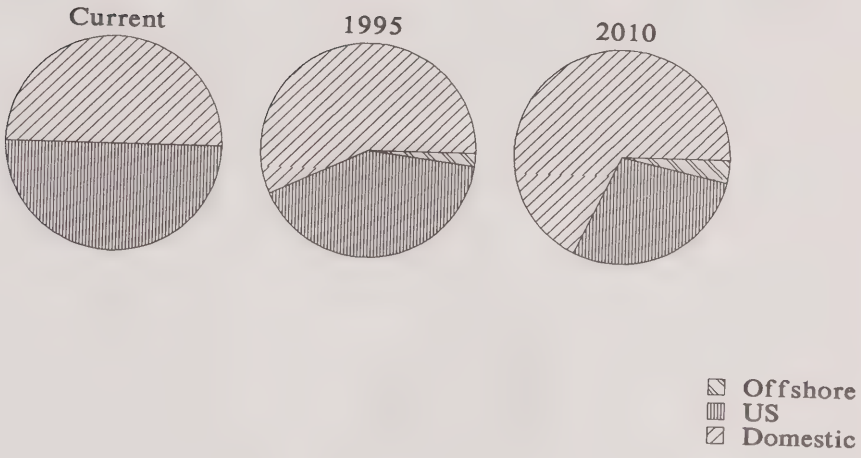
Figure 1-26
Ontario Lumber Market Demand
Opportunity vs Realization
(thousands of m^3)



Source: WRA

The impact of these changes and the opportunities presented by the domestic market, plus some minor development of the offshore market, will be for a significant change in the geographic distribution of sales. (Figure 1-27). The importance of the US is expected to decline as the other markets become more attractive.

Figure 1-27
Lumber Distribution - Ontario
(%)



Source: WRA

Development opportunities for hardwood lumber appear to be relatively limited. The availability of the good quality species is declining, but there are significant volumes of lower qualities. There are a number of technological developments that permit economic production of suitable lumber from lower quality resource. It is believed likely that companies will adopt these approaches in order to maintain current levels of production.

Quebec

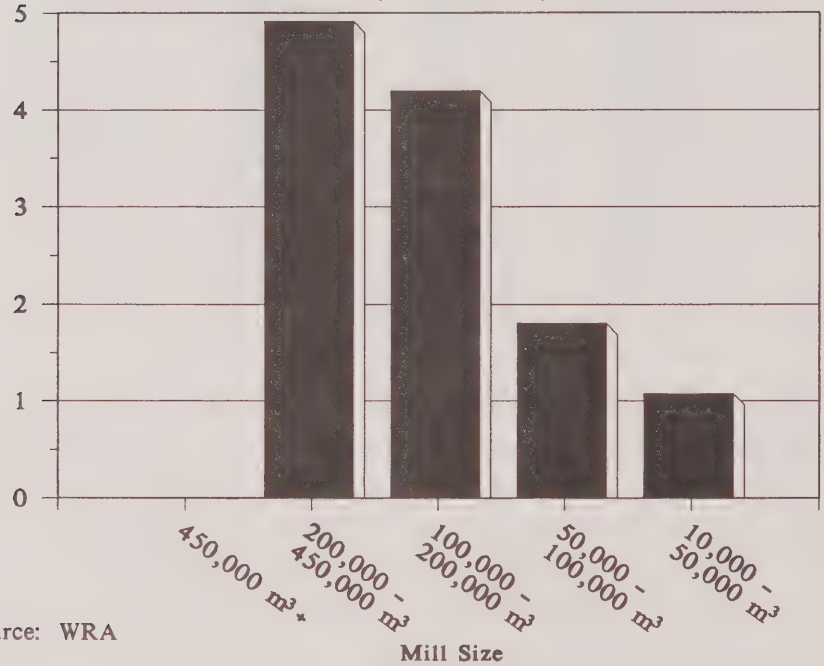
In 1986, Quebec produced 12 million m^3 of lumber - representing 22% of Canada's total - of which 11.6 million m^3 was softwood.

A total of 355 sawmills are reported on in Statistics Canada's 1985 Annual Survey. The sawmill and planer mill sector employed 15,010 workers in 1985.

A more detailed analysis of information developed by the Quebec government indicates that the actual number of mills registered as being in commercial production is 645. Of these, however, about 80% (over 500) are very small and produce less than 10,000 m^3 annually. These mills probably account, in total, for about 5% of production in Quebec.

The size classification for the major portion of the sawmill population is shown in the following figure.

Figure 1-26
Sawmill Profile - Quebec
(millions of m^3)



Source: WRA

Though there are none of the very large "super mills" found in BC and Alberta, the major part of production in Quebec comes from large and medium-sized mills.

Quebec's sawmill sector has evolved and polarized into two groups: large/medium-sized facilities whose fibre supply, transportation economies and residue income permits reinvestment in technology, and small facilities, limited in growth by fibre supply economics, lack of economic transportation and poor returns from residues.

Quebec has many fully modern sawmills combining parallel primary-breakdown lines with band mills for larger logs and chipper-canters for smaller logs. Much of that breakdown machinery is of Quebec design and manufacture, further combining enhanced employment spin-off and providing customized equipment to suit that resource. In addition, the Chip-n-Saw technology developed in BC has been successfully introduced, and there is a developing interest in scanning and optimization technology.

These new approaches, together with governmental pressures, are increasing the amount of small logs that are first processed through sawmills to provide lumber and the chips furnished to the pulp mills.

Numerous smaller operations, often operated seasonally by family groups, help provide individual and community income support, supplementing other rural income sources.

The production of S-P-F counts for 95% of the softwood lumber manufactured in Quebec. Though most of this volume is manufactured to North American specification for commodity lumber, there is a growing volume of metric and other special sizes being developed. It appears that more mills are willing to consider the manufacture of noncommodity higher-value items even though the volumes of orders are often small.

Almost all of the production from the large mills is kiln dried, but there are a number of the medium-sized mills and many smaller mills that still sell green lumber, mainly to the domestic market.

The output from the mills is estimated to be shipped by destination as follows:

Table 1-5
Destination of Quebec Production - 1986

Canada	50%
US	48%
Offshore export	2%

Source: Statistics Canada

It is possible that the levels shown for export to the US (which are based on export statistics) are understated due to some volumes shipped to reload centres in Ontario. This redistributed volume could be sufficient to increase the US shipment proportion to up to 55% with a corresponding reduction in the Canadian share.

About two-thirds of the US volume is shipped by road to the market, with New York and New England receiving about 75% of the volume. Even in the case of rail shipment, a high proportion of sales is to the same region. It is clear, therefore, that a large part of the Quebec lumber production is dependent on activity in the North East region of the US.

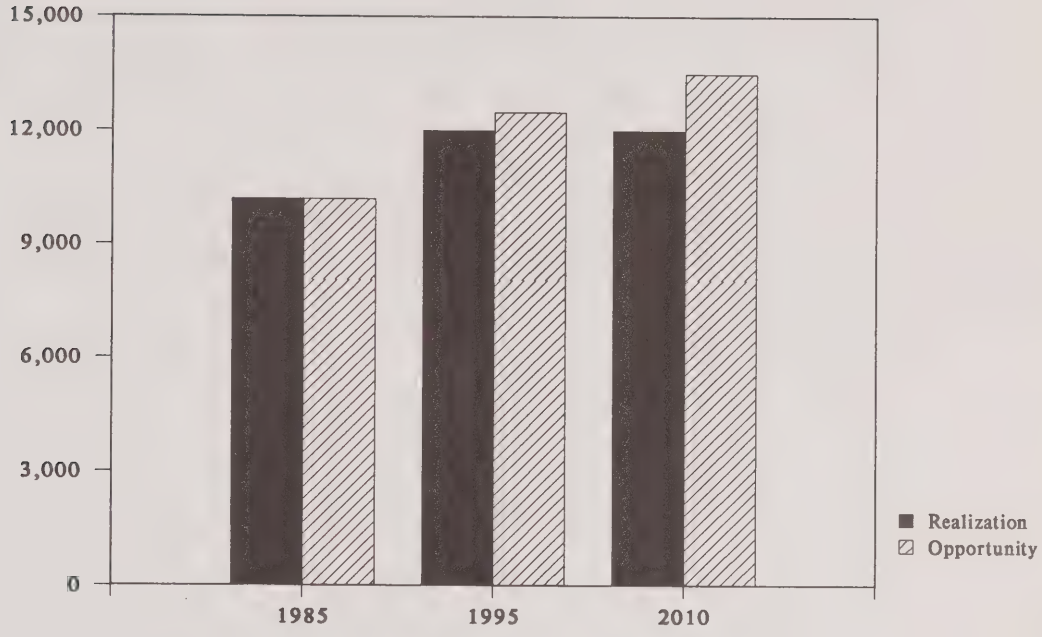
Offshore exports in 1986 were low and well below the levels that had been achieved in earlier years. In 1987, however, the volume reached close to 500,000 m^3 as the mills became more interested in the opportunities these markets present.

Of the volumes shipped for consumption within Canada, over 70% is likely consumed within Quebec, and a significant proportion is supplied by the smaller mills catering to local needs.

Hardwood lumber production in Quebec is small, relative to softwood, and amounts to 350,000 m^3. Maple accounts for 30% and, of the balance, birch is the most significant. The products manufactured vary widely, as in the case of Ontario, from high-value furniture stock to low-cost pallet material. A significant proportion is exported to the US and many parts of the world, including the Orient. In general, however, the emphasis of hardwood production is on the more valuable species, and there is only a limited use made of the substantial volumes of aspen/poplar that exist in the resource.

Growth prospects for Quebec lie primarily in value rather than volume. Though 1985 figures indicate that there are small incremental volumes of softwood available, more recent figures suggest that the resource is being overcut. Consequently, the current lumber production volume of around 12 million m^3 is at, if not above, the likely volumes in the future. In Figure 1-29 some increase is seen on the base year of 1985, but the future market opportunity is greater than that likely to be realized due to fibre limitations.

Figure 1-29
Quebec Lumber Market Demand
Opportunity vs Realization
(thousands of m^3)



Source: WRA

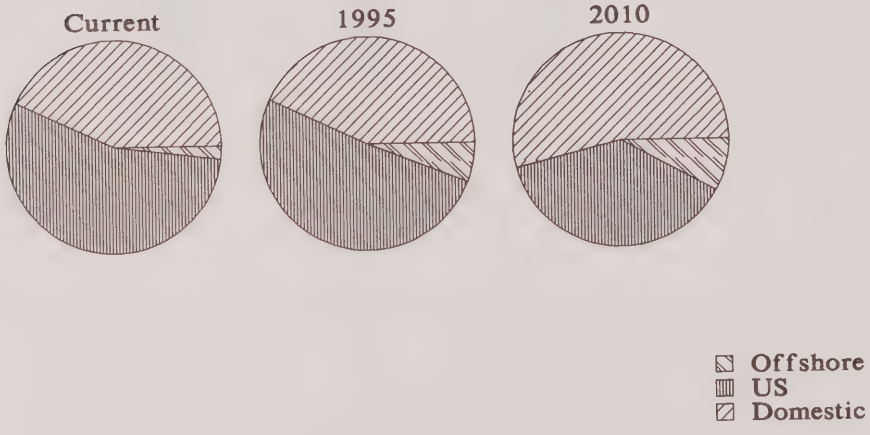
Over one-third of the production is from medium-sized mills which produce commodity grades and these operations will be coming under increasing competitive pressure from the large Quebec mills and the very large mills in the West. Even though their level of technology use is often better than in Ontario, they are too small to keep unit costs down.

Though the individualistic character of medium and small mills may make it difficult, there is a strong case, conceptually, to merge smaller operations in order to develop a single large facility. It is believed that there are a number of cases in Quebec where several small/medium mills draw on the same general area for fibre. A single mill would be much more viable, particularly for commodity production.

Quebec is also well placed to manufacture for offshore markets. There is a growing interest in the production of suitable specifications, and it is felt that the major opportunity for growth lies with these markets. Joint industry/government programs are now in place and should provide much of the market development effort required. As the program evolves, greater focus on further processing to meet the specific needs of consumers of higher-value products will be appropriate.

The domestic market opportunities for both commodity and specialty lumber and the offshore markets are expected to be more attractive than the fiercely competitive US market. Consequently, as is shown in Figure 1-30, the dominance of the US market is expected to decline in the long term.

Figure 1-30
Lumber Distribution - Quebec
(%)



Source: WRA

The outlook for hardwood lumber is essentially as described for Ontario.

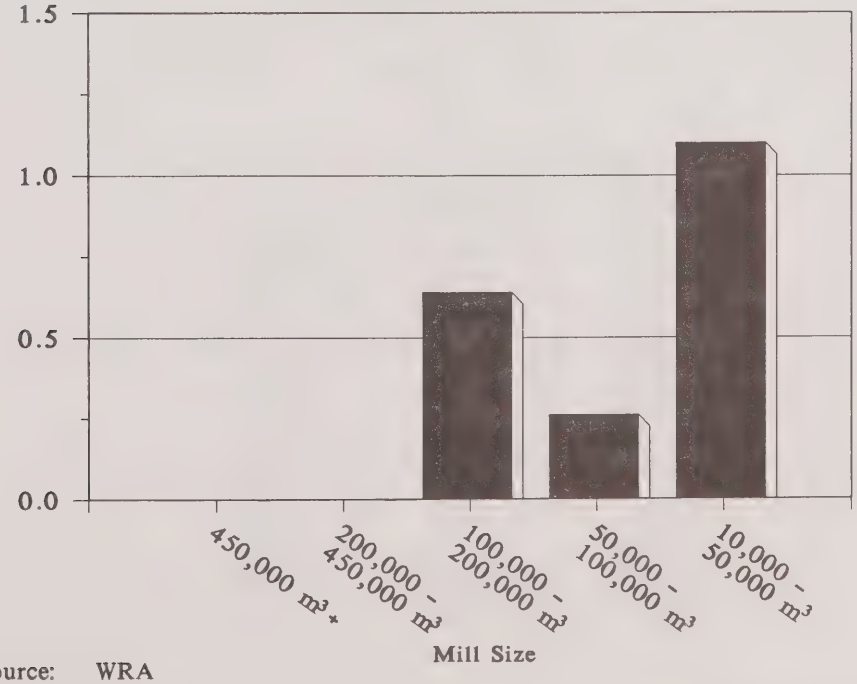
Atlantic

The majority of sawmilling activity in the Atlantic region takes place in Nova Scotia and New Brunswick. Though there are numerous extremely small operations in Newfoundland and Prince Edward Island, the total value of their shipments amounts to less than 5% of the total for the region. The following analysis, therefore, focuses on Nova Scotia and New Brunswick.

The total production of lumber in 1986 was 2.2 million m^3, or 4% of the Canadian total. Over 97% was softwood, with hardwood accounting for just 57,000 m^3.

Statistics Canada data indicate that there was a total of 160 sawmills employing 3,530 workers in 1985. A more detailed analysis of provincial data indicates that over 98% of production came from a total of 240 mills, though there are over 300 other very small operations registered as sawmills. There are fewer than 35 mills producing more than 10,000 m^3 annually and their production is shown in Figure 1-31.

Figure 1-31
Sawmill Profile - Atlantic
(millions of m^3)



Source: WRA

There are no large mills, in the overall Canadian context, and only in New Brunswick are there any medium-sized mills. Close to 70% of production in the region is manufactured by small or very small mills. It should be noted, however, that a new mill, currently under construction in New Brunswick, will have an annual capacity exceeding 200,000 m^3.

There are a few chipper canter-type headrigs in the medium-sized mills in New Brunswick; otherwise, the primary breakdown is with carriage circular or band saws. Apart from some scanning equipment for sorters and tallying, there is limited use of any modern optimization technology. In addition, few of the mills have kiln drying facilities. A major problem faced by the industry is the number of small mills. These mills have insufficient throughput to justify investment in much of the latest equipment, since most of the new technology is focused on reducing costs and improving yields in high volume mills.

Even though most of the mills are small, over 80% of production is in the form of commodity dimension S-P-F for construction. The balance is principally S-P-F cut for export plus specialty items from higher-value species such as white pine.

The estimated destinations of the lumber shipped by the manufacturers in the region are divided as follows, according to Statistics Canada:

Canada	63%
US	29%
Offshore export	8%

Of the volume shipped within Canada, about 85% is within the Atlantic Provinces. It would appear likely that the majority of the shipments to the US comes from the larger companies such as Irving and Fraser, and the many small mills are heavily dependent on local markets.

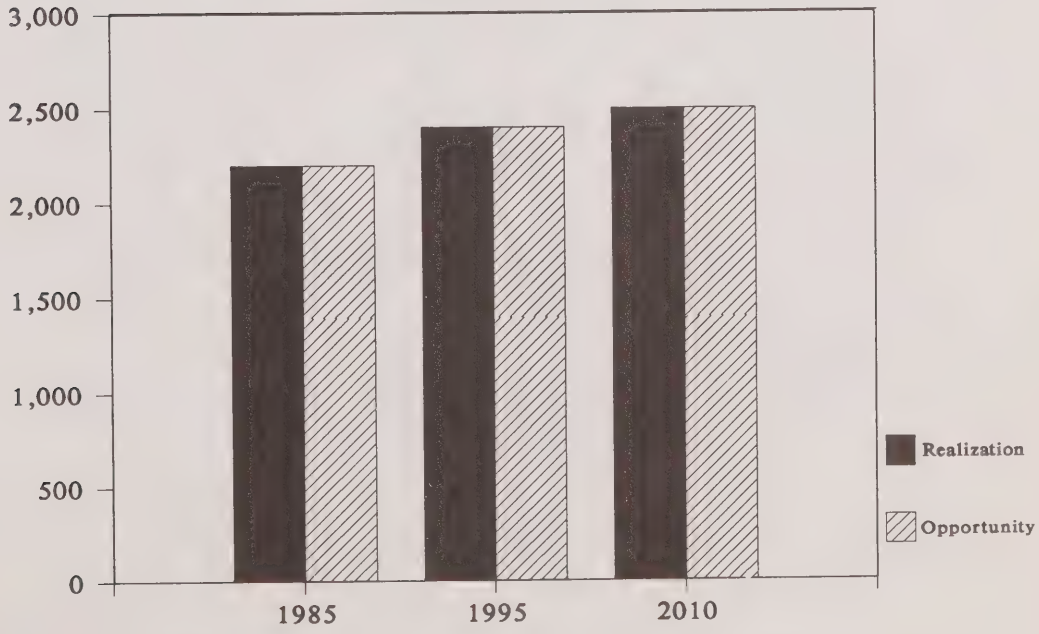
The shipments to the US are primarily into New England (70%), and 95% of the lumber moves to the markets by road.

Offshore exports are, currently, a small proportion of the shipments and are almost all in the form of S-P-F cut to European specifications. The principal market is the UK which accounts for 75% of offshore exports.

Lumber producers in this region are, potentially, well placed to expand. They are well placed geographically to compete in their own local market, which takes over half of their production, and in the nearby New England market, which accounts for 20%. Furthermore, there is considerable interest in, and knowledge of, the European markets.

In the following Figure 1-32, a balance is shown between the market-driven opportunity and the realization. The opportunity, from only the market demand point of view, would be much greater but, with the current asset base, it is questionable whether the industry would be in a position to compete. Information on production costs is sparse and varied. In reality, however, the amount of additional fibre suitable for sawmills (and in particular for the production of offshore specifications) is limited. Consequently, even if a much greater opportunity existed it could not be realized.

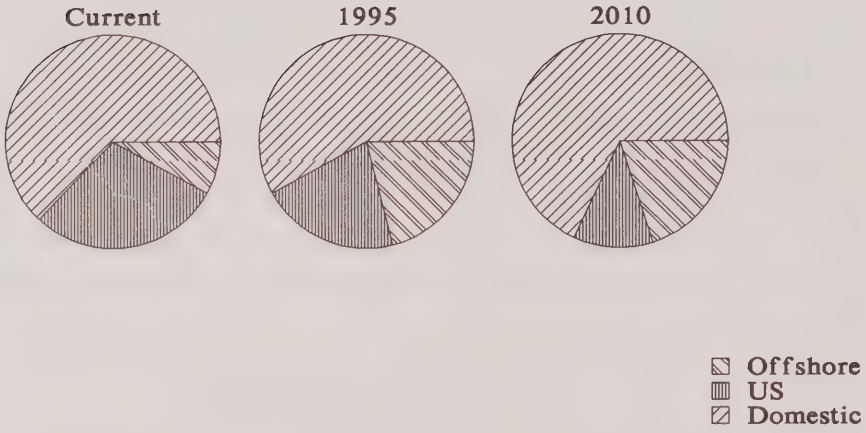
Figure 1-32
Atlantic Lumber Market Demand
Opportunity vs Realization
(thousands of m^3)



Source: WRA

The projected outlook for shipment distribution is shown in Figure 1-33. Domestic demand is likely to continue to dominate, but it is believed that offshore exports will displace part of the shipments to the US.

Figure 1-33
Lumber Distribution - Atlantic
(%)



Source: WRA

Total Canada

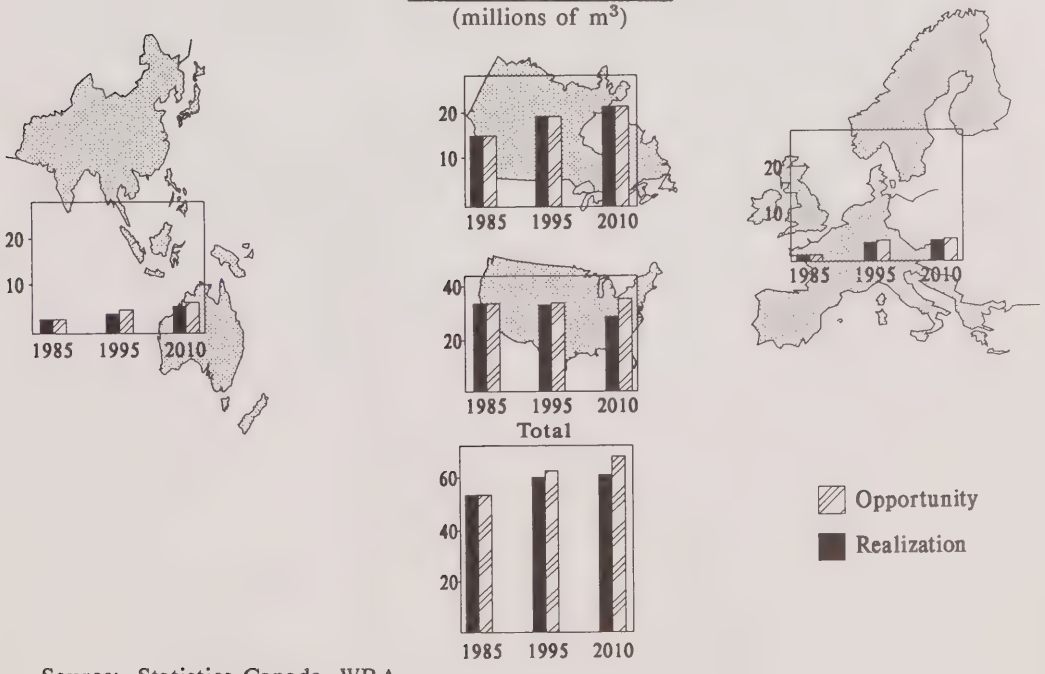
The projected outlook for Canadian shipments of lumber is presented in Figure 1-34. These projections result from analysis of:

* the market opportunities;
* competition from other supply sources;
* the apparent fibre constraints in some regions based on volume and quality.

It has been assumed that Canadian demand will be satisfied by domestic producers. There is, therefore, no shortfall between opportunity and realization for the local market. Though the increase from 1985 to 1995 for exports to Western Europe may appear large, the 1987 volume of export to the area reached 3.2 million m^3. It is also worth noting that the 1987 volume to the US was 34.0 million m^3; the long-term projection therefore represents a substantial decrease. It is believed that Canadian industry efforts to rely less on the very cyclical, competitive, low-priced and politically sensitive US market should be increasingly successful in the long term.

If this strategy of market diversification is successful, it will be important that Canadian suppliers maintain their commitment to offshore markets, and resist the temptation to revert to focussing on the US when that market inevitably sees its relative attractiveness improved.

Figure 1-34
Projected Canadian Lumber Shipments
Realised vs Opportunity
(millions of m^3)



Source: Statistics Canada, WRA

NOTE: The US and total volumes are on a different scale.

2

PANEL PRODUCTS

TABLE OF CONTENTS

Overview

The range of products that are classified as panel products is very wide and, though many result from different production processes, there is often a significant overlap at the consumer level. There are also products such as laminated veneer lumber (LVL) or parallel strand lumber (PSL) which utilize processes that originate in the traditional panel product category but compete directly with lumber. Furthermore, there are processes such as cement fibre board or gypsum fibre board where wood fibre only forms part of the raw material furnish.

For the purposes of this study, the analysis has been limited to the major product lines and the focus is on existing products and those that offer potential for Canada.

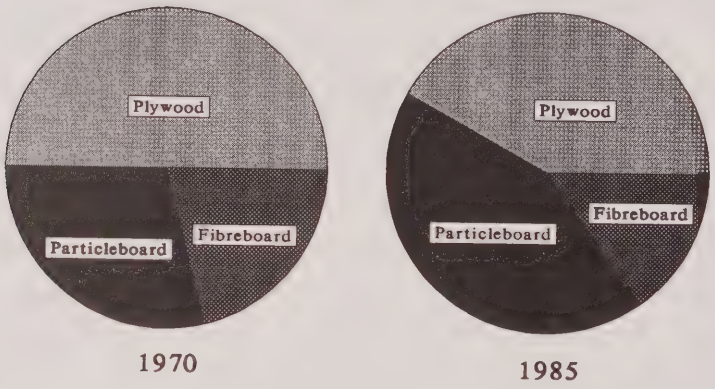
Worldwide consumption of panel products is expected to grow, but a substantial part of this growth will be satisfied by domestic and/or local production. Most of the growth will be in the form of reconstituted board which can accept a wide variety of raw material furnish. There is little constraint, therefore, in terms of fibre availability.

The principal growth opportunities for Canada will relate to domestic consumption and supply of reconstituted boards to certain parts of the US. In addition, however, there is likely to be a substantial growth in the potential for exports of softwood plywood to Western Europe and both softwood plywood and reconstituted boards to Japan. Though the volumes are likely to be small relative to North America, these offshore markets could offer attractive incremental volumes.

Size and Nature of the Market

The panel board industry currently produces approximately 110 million m^3 of product worldwide--equivalent to about one-quarter of the lumber production. There has been significant change in the last 15 years in the type of products within the panel board sector. Whereas, in 1970, plywood represented half of the products produced, by 1985, this share had dropped to only just over 40% (Figure 2-1). The major growth has been in particleboard. It should be noted, however, that within the statistics for particleboard are included the increasing volumes of waferboard in North America.

Figure 2-1
Panel Board Products Consumption
1970 vs 1985



1970 1985

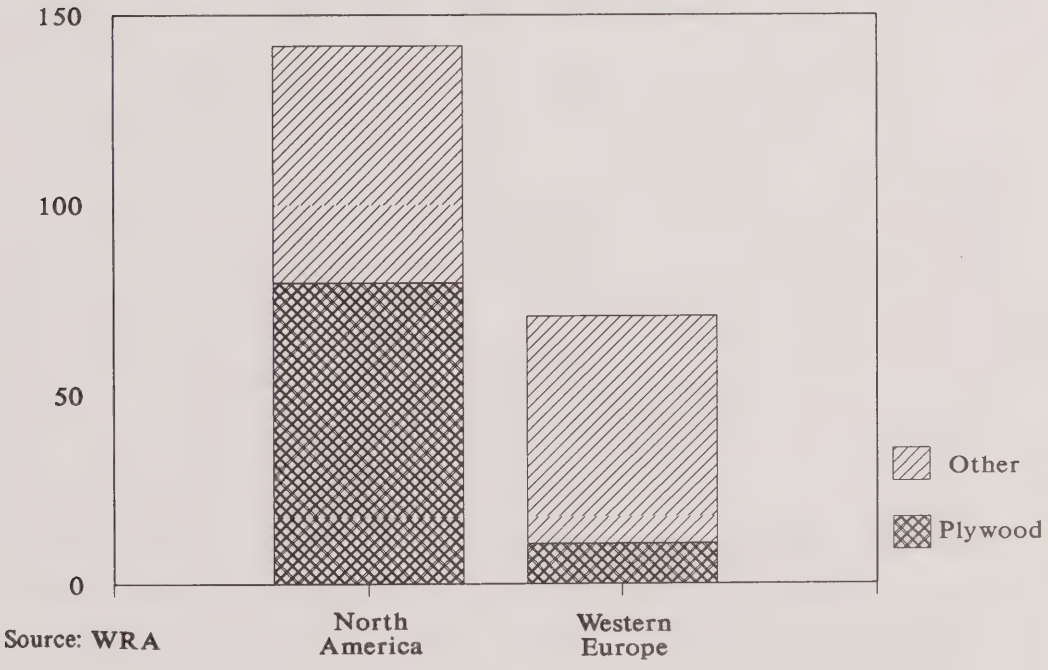
Source: WRA,FAO

Of the plywood, approximately half of the production is hardwood plywood produced in a number of different regions--primarily S.E. Asia, but also Japan and Western Europe, based largely on imported logs. The other half is softwood plywood, which is mainly produced and consumed in North America.

Differences in construction techniques for residential housing are a prime reason for the very different consumption patterns in the various regions. The North American system of framing and sheathing houses has resulted in a very large demand for a utility structural panel. Most other areas, except for Japan which uses a very different wooden housing approach, use other materials such as brick or cement block. The major uses of panel products in these regions are, therefore, in a great variety of nonstructural applications even when used in construction.

As a result of these different approaches, there are substantial differences in the size and nature of the markets (Figure 2-2). Not only is the per capita consumption of panel boards in North America double that of Western Europe, but also the significance of plywood is far greater.

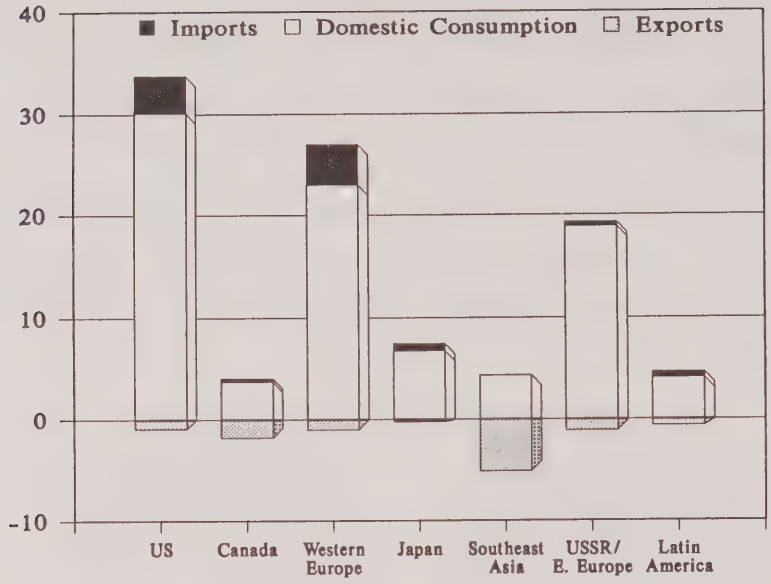
Figure 2-2
Per Capita Consumption - Panel Products
(m^3/1000 people)



Source: WRA

The supply/demand balances for the major regions are shown in Figure 2-3. Overall, the significance of interregional trade is very low, since domestic shipments of locally produced product account for 90% of consumption. Even Western Europe, which is the largest deficit region, satisfies 85% of consumption domestically.

Figure 2-3
Panel Products Consumption
(million m^3)



Source: FAO

Global trade flows are not a very important element in the panel board business. The most significant flows are:

* S.E. Asian hardwood plywood to North America and western Europe;
* reconstituted structural boards (waferboard/OSB) from Canada to the US;
* North American softwood plywood to Europe

Due to the fragmented nature of the panel board industry, in terms of the different products and processes and the lack of significant worldwide trade, it is not possible, or relevant, to obtain any reliable indication of the long-term price history of panel products. Even within regions there can be significant differences for similar products. For example, a comparison of plywood prices in Canada with those in the US shows significant variations in trends. Substantial tariffs on plywood between the countries and different supply/demand situations in each country result in differing market prices and trends. In 1986, for example, prices increased substantially in Canada, yet in the US there was only a limited change.

Over the long term, there has tended to be less instability in prices for panel board than for some other wood products. In constant dollar terms, however, the prices for the commodity grades of both softwood plywood and reconstituted products have shown an overall decline.

The most significant trends in panel board consumption and production have been:

- the rapid expansion in waferboard/OSB in North America. Production of OSB has now come on stream in Western Europe but the volumes are still very small;
- recent rapid growth (from a low volume) in the use and production of Medium Density Fibreboard (MDF) in Europe;
- the dramatic growth in hardwood plywood production in Indonesia, following the ban on log exports.

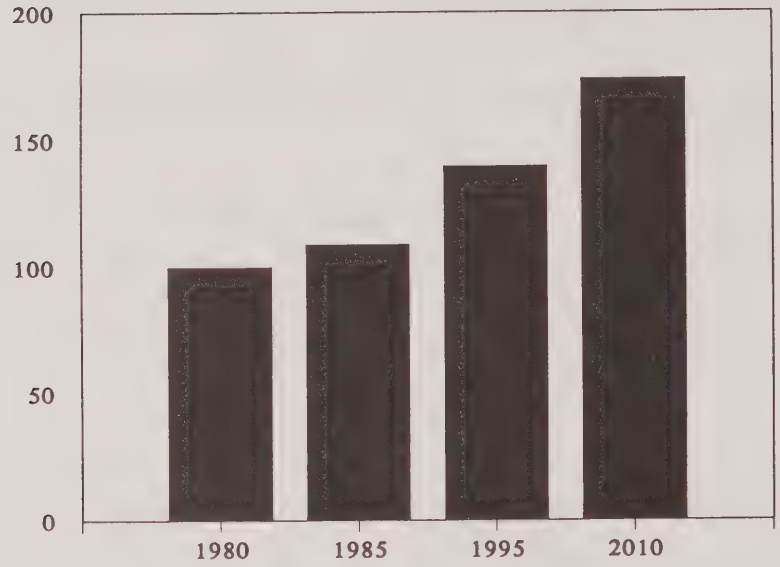
There are also indications of new panel board capacity in areas such as Latin America, but it is believed that much of this production will tend to be consumed domestically.

Demand Outlook

The growth in the consumption of panel board products worldwide was very rapid during the 1970s, when the average annual increase was close to 4%. This level of growth was not sustained in the first half of the 1980s and, partly as a result of the general economic situation, the growth rate dropped to 1.5% per year. Some recovery is expected in the period to 1995, but the increases are not expected to be at the rates evident in the 1970s, since much of the substitution of panel boards for lumber has already occurred in the industrialized areas. In the longer term, the growth rate is expected to decline further and be a little below the average economic growth rate. This slower growth applies mainly to the industrialized countries where the great majority of panel board consumption takes place. The developing economies are expected to increase their consumption significantly, but from a very low current per capita consumption level.

The overall outlook for demand is shown in Figure 2-4. Though the growth rates used are relatively low, the incremental volumes of demand represent substantial new capacity over the 1985 level--30 million m^3 by 1995 and a further 35 million m^3 by 2010. It should be noted, however, that by 1987 a significant portion of the 1985/95 increased demand is estimated to have already occurred.

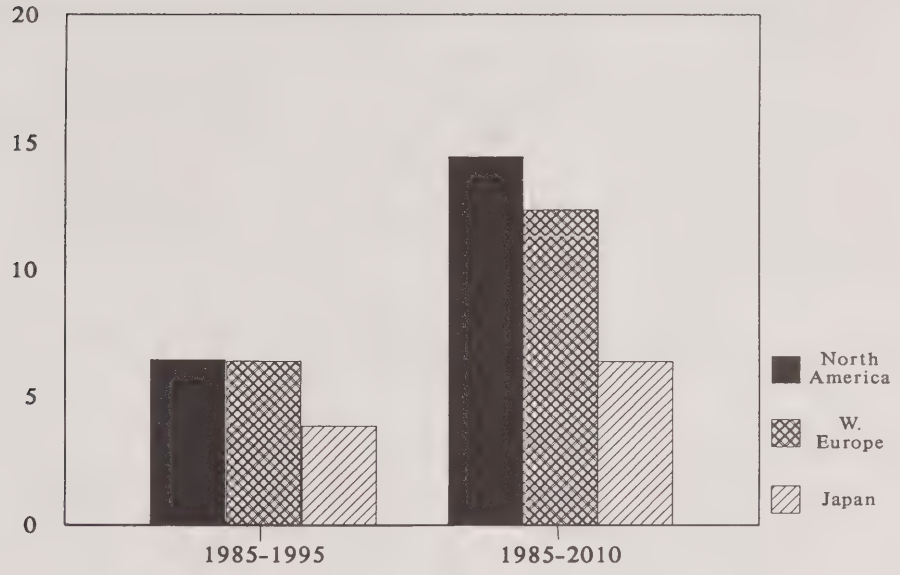
Figure 2-4
World Panel Products Consumption
(millions of m^3)



Source: WRA

The incremental demand by major regions of significance to Canada is shown in Figure 2-5.

Figure 2-5
Incremental Demand - Panel Products
(millions of m^3)



Source: WRA, RISI, ETTS IV

In addition to these regions, about one-third of the medium-term expansion expected in consumption worldwide is accounted for by the USSR/Eastern Europe. These regions are relatively insulated from the areas of importance to Canada, and variations in the projection would have little impact on the opportunities presented by the major regions identified in Figure 2-5.

It is expected that the products for which the greatest development will occur will be reconstituted panels. Structural boards such as waferboard and OSB, and other reconstituted products, such as MDF, are likely to be the major growth areas. In the longer term, however, products such as LVL and PSL could become very significant. Hardwood plywood growth is expected to be strong in the medium-term, principally as a result of the continued supply increases in Indonesia. The production capacity in that country already exists to produce substantially greater volumes and this availability is expected to result in the development of a much greater per capita consumption. Longer term growth is likely to be constrained by the availability of suitable timber.

In contrast, the softwood plywood industry, which is mainly in North America, is likely to come under increasing pressure from substitute products.

Market Analysis

North America

Within North America, there is a reasonably clear distinction between structural panels and panels used for other purposes. As a result of traditional construction methods in both the US and Canada, the volume of structural panels is substantially greater than in any other region. Thus, as can be seen from Table 2-1, about two-thirds of the products used are classified as structural. This is in contrast with Western Europe where total plywood represents just over 15% of panelboards and much of this share is hardwood plywood used nonstructurally.

Table 2-1
North American Wood Based Panel Consumption - 1986
(thousands of m^3)

	US	Canada
Structural		
Softwood Plywood	18,600	1,400
OSB/Waferboard	3,500	635
Total	**22,100**	**2,035**
Non Structural		
Particleboard	6,600	1,050
MDF	1,420	50
Hardboard	2,300	140
Hardwood Plywood	1,200 [1]	150 [1]
Total	**11,520**	**1,390**
Total	**33,620**	**3,425**

1 estimated

In general, it is important to note that, though specific classifications exist and are used to identify the different types of panel, there is considerable overlap. Some examples of this lack of definition are:

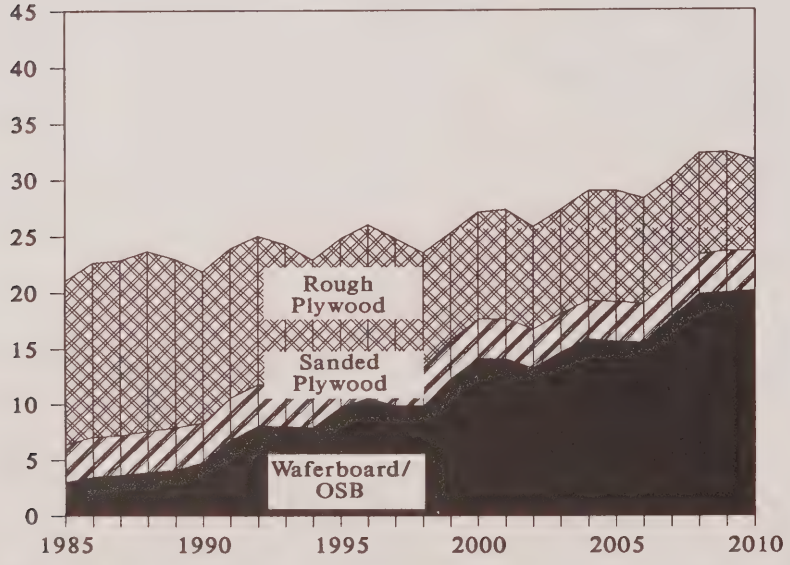
* 'hardwood plywood' can be produced with softwood veneers in the centre or even with particleboard or MDF cores;
* about one-third of the particleboard in the US is used for floor underlay (i.e., structurally).

Furthermore, as technologies evolve, new combination products are being developed which will make the distinctions even less precise. Consequently, though the following discussion is based on classical definitions, there can be some exceptions.

US

The outlook for structural panels is for an increase in demand levels over the medium-term to 1995. There will, however, be some significant changes in the nature of the product that will satisfy this demand. The growth in market acceptance of substitute boards, such as Oriented Strand Board (OSB) and waferboard, or even oriented waferboard, has been rapid. The projections (Figure 2-6) indicate that this growth will continue with the result that, from a 1985 market share of under 15%, OSB/waferboard will account for 40% by 1995.

Figure 2-6
US Consumption of Structural Panels 1985-2010
(millions of cubic metres)



Source: WRA

This projected growth is largely predicated on two major factors:

* OSB/waferboard can be produced at a substantially lower cost than plywood due to cheaper raw material, greater yield of product and a greater degree of automation;
* the product can be substituted for plywood.

It is possible that these two factors have been overly emphasized in the projections. Considerable technological improvements in the recent past have resulted in some dramatic production cost-savings for plywood, and the necessity for high-quality peeler logs has diminished. In addition, a greater percentage of the log can be converted to veneer.

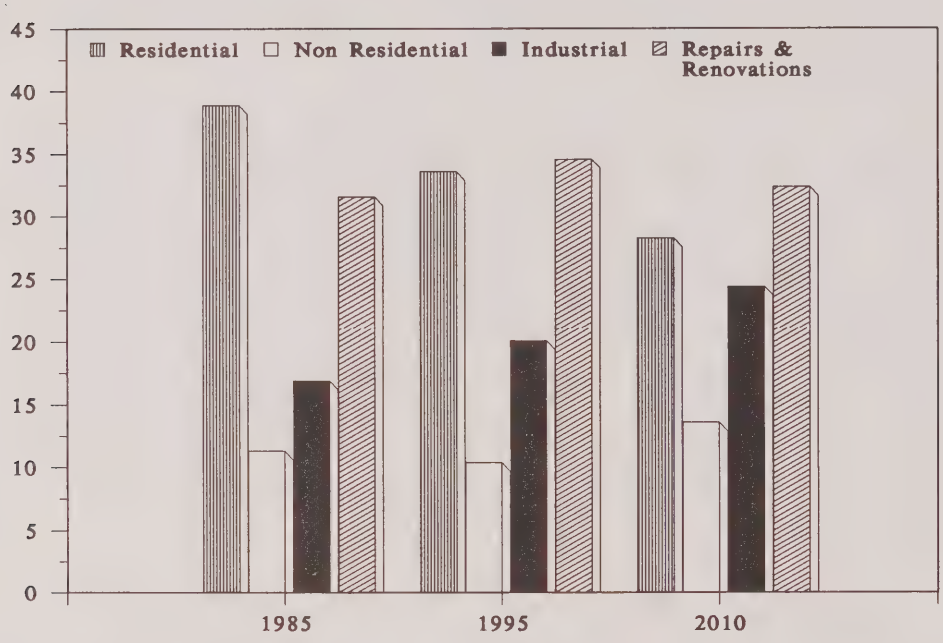
From the market point of view, there is evidence that consumers do not necessarily regard waferboard, in particular, as substitutable for plywood in a number of uses, in spite of a price differential. There is little doubt that a part of this consumer attitude is due to tradition and an inherent resistance to change. This resistance will inevitably be overcome. There are certainly some uses where plywood is more suited for end-use application and a cost differential is of secondary importance. Plywood has a significant weight advantage over OSB/waferboard - 500 kg/m^3 compared with 650 kg/m^3 for OSB/waferboard. This advantage has implications in both the economic hauling radius by truck or rail, as well as its use for packaging, and its ease of handling at the construction site.

Some years ago, the American Plywood Association moved towards a Performance Standard approach for the specifications of structural panel products. The objective was to concentrate more upon how the panel is to perform in use, rather than how the panel is produced, or its appearance. Thus, if a builder requires a certain rigidity and load-bearing capacity for a floor, he can choose a panel which is certified to provide these characteristics. To use a hypothetical example, the panel might be waferboard 19.5 mm thick, or OSB 17.5 mm thick, or plywood with a special lay-up only 16 mm thick.

This approach encourages technical substitutability and appears reasonably well accepted in the market - particularly by large construction companies where cost savings in materials can be significant.

There will, however, be some changes in the use of structural panels over the medium-term. Projections for market share by sector are shown in Figure 2-7. Whereas residential construction is currently the major use, consumption in this sector is not expected to rise. The expected growth will occur in other sectors and residential construction will decline in importance.

Figure 2-7
Share of US Structural Panel Consumption by Sector
(%)



Source: WRA

It should also be noted that it is the residential construction sector that has been the major consumer of OSB/waferboard - currently over 50% of the consumption of these products. This sector, together with the repairs and alterations sector, needs a basic commodity structural panel, and OSB/waferboard is well suited. The medium-term projections indicate that, by 1995, the nonveneered boards will have over half of this market. In addition, there will be substantial penetration into the repairs and alterations market - from under 10% currently, to over 40% by 1995. There will be slower growth, however, in the other market sectors.

Overall consumption of structural panels in the longer term is projected to continue to increase and an extrapolation of current trends would indicate that, by 2010, the plywood share would drop to 35-40%. There is, however, the possibility that the penetration by OSB may be overstated and the plywood industry will maintain a stronger position. Sanded and specialty plywoods appear likely to maintain current volumes, and sheathing plywood, after initial losses to substitute boards, could consolidate its share in uses where plywood has specific advantages.

The implications to Canada of the projected consumption of structural panels in the US are relatively complicated.

Softwood Plywood

At this point in time, the potential impact of the Free Trade Agreement is far from clear. Industries on each side of the border appear to fear the competitive threat from the other side. There are also code and specification issues in both countries that cause confusion. There is an intuitive belief that, if BC producers of lumber can be competitive in the US, under zero tariff, so too should BC producers of plywood. On the other hand, Canadian plywood prices in recent years have been strong relative to price levels in the US, and free entry to US suppliers would have had a detrimental impact on price (and therefore profit).

Currently, the focus of the FTA discussions is on the technical aspects of product acceptance in Canada. Interestingly, there is no emphasis on acceptances in the US, though the Canadian industry is trying to raise this issue. If the focus remains at the technical level, there is a real possibility that the matter will not be resolved and the tariff barriers will remain in place for some time. However, it may be that it will become a political issue and viewed as a test case of the FTA.

An analysis, both of long term historical prices and production costs, was undertaken in a study prepared in 1986 (A Strategic Analysis of the BC Panelboard Industry). This analysis suggested that the effect of zero tariff in both directions across the US/Canada border could be that sheathing plywood is exported to the US but sanded plywood is imported. The results of the computer simulation of the zero tariff situation indicated, however, that the volumes in either case would not be very great. This simulation did not take into account the higher stumpage levels now applicable in BC. These have the greatest impact on BC Interior sheathing costs, which suggests that, unless BC mills adopt the latest production technologies, it will be difficult for them to compete in the US.

OSB/Waferboard

Up to half of Canadian production has traditionally been sold to the US. Though there is projected to be substantial growth in consumption, this is likely to be matched by capacity expansion in the US. Since OSB/waferboard tends to be consumed reasonably close to production, and since many areas have the necessary raw material, it is necessary to identify likely trends on a more regional basis.

In Table 2-2, projected consumption levels are presented for the four major regions in the US. The area of greatest growth is the US South, and it must be assumed that this region will largely be supplied by additional capacity in the area.

Table 2-2
US OSB/Waferboard Consumption - by Region
(thousands of m^3)

	NE	NC	South	West	Total
1985	1,010	1,000	600	420	3,030
86	1,180	1,190	680	480	3,530
87	1,310	1,200	700	490	3,700
88	1,360	1,250	800	520	3,930
89	1,380	1,260	910	580	4,130
1990	1,500	1,430	1,150	670	4,750
91	2,050	1,980	1,790	980	6,800
92	2,300	2,270	2,230	1,260	8,060
93	2,200	2,170	2,270	1,330	7,970
94	2,100	2,060	2,350	1,380	7.890
1995	2,560	2,480	3,020	1,690	9,750

Of greater interest to Central and Eastern Canada is the growth still projected for the North East and North Central Regions. These are the regions that were first exposed to waferboard with Canadian products and subsequently with local capacity. OSB/waferboard is well established in these regions, but there is still projected to be an increase of around three million m^3 of consumption relative to 1985. The capacity to satisfy this increase in consumption is equivalent to about 15 very large mills, each with an annual requirement of over 250,000 m^3 of low-cost fibre within an economical haul of the mill. Part of this new capacity is in place or being built but the projections indicate a need for a number of new plants.

The ability of these regions to provide the resource for such an expansion in capacity is limited, and this growth should provide some significant opportunities for Canada.

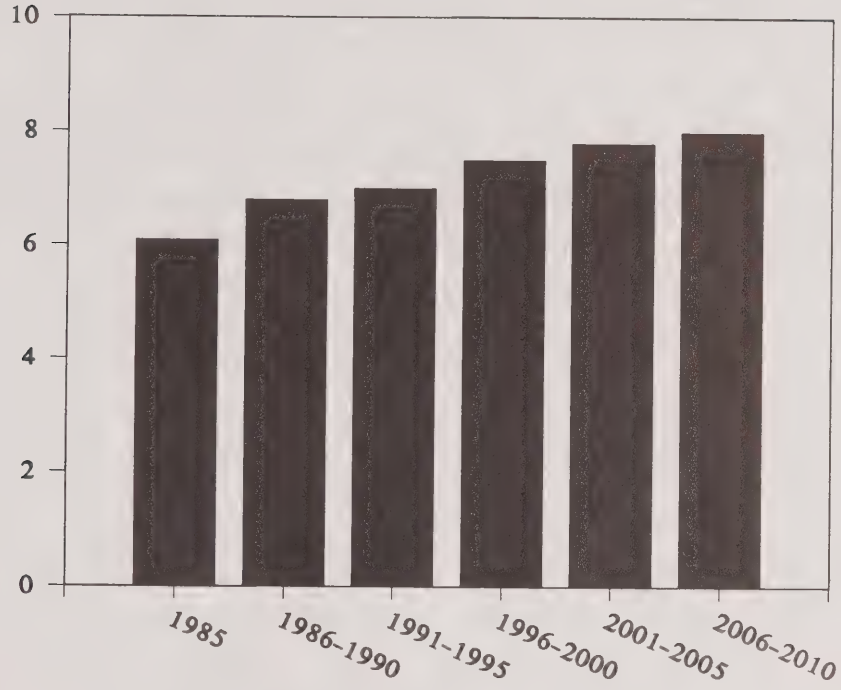
In the West, there is substantial additional volume required. It is possible, however, that the levels projected may be somewhat low, since the OSB/waferboard penetration by 1995 in the West is only estimated at a little over 25% whereas, for the rest of the country, a level of close to 45% is projected. At this lower level of consumption, though the demand increases by over one million m^3, the need for new capacity in addition to recent new plants is limited to about three large operations. At a higher level of penetration, say 35%, a further three facilities would be needed. The resource for these plants exists not only in BC and the Prairies, but also in the US.

In summary, there is considerable growth foreseen in the consumption of structural panels in the US. The bulk of this growth is in OSB/waferboard, and this presents some interesting opportunities for Canada. There are, however, two concerns. The first was noted earlier and relates to the possibility that the projected continued expansion of OSB/waferboard may be somewhat overstated, except in the West US, in the light of both market requirements and plywood production costs. The second concern is exchange rate. The strengthening of the Canadian dollar that has been evident recently has a very serious impact on the profitability of Canadian operations. Analysis of the impact of a long-term strengthening of the Canadian dollar to 90¢ by 1991 (undertaken in the 1986 report referred to above) suggested that OSB/waferboard exports to the US could actually decline.

The outlook for nonstructural, wood-based panels consumption is for some modest growth in terms of the total volume. It is expected, however, that there will be significant changes in consumption of the various types of panel included under this classification.

In the early 1980s, the particleboard industry was significantly constrained by environmental concerns over formaldehyde emissions. New processes and binders have overcome most of these problems, and particleboard volumes have been growing significantly in recent years. Several new plants are under construction. Much of the increase has been a result of the strong furniture market which, despite considerable import substitution, has been expanding significantly. In addition, the volumes consumed in the kitchen cabinet industry have been influenced by the strong residential markets and the rapid increases in repairs and alterations. Some further increases are expected in particleboard consumption in the medium-term - equivalent to 2% per annum. Projected consumption of particleboard is shown in Figure 2-8.

Figure 2-8
Projected US Consumption of Particleboard
(millions of m^3/y)



Source: WRA

In the longer term, the rate of growth is expected to decline to less than 1% per annum.

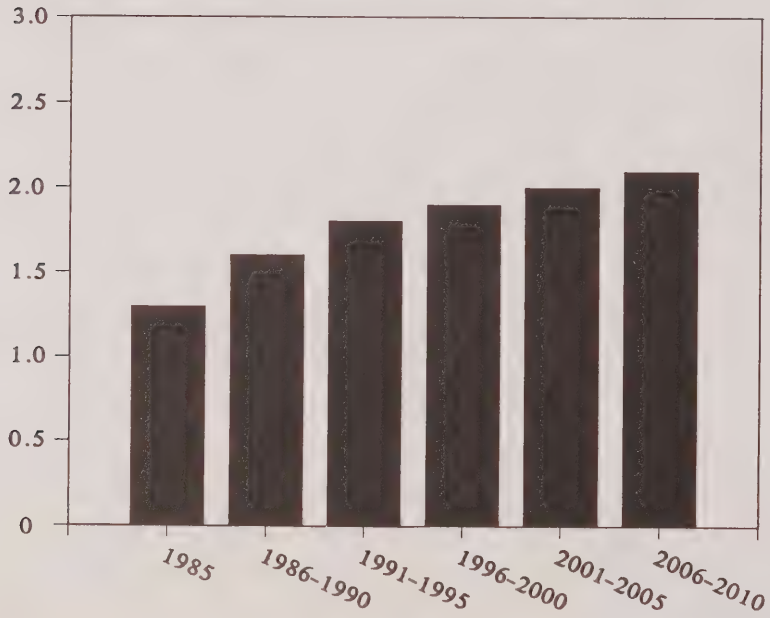
MDF consumption is currently around 1.3 million m^3 and has expanded significantly from an average annual consumption level of around 1 million m^3 during the first half of the 1980s. Though MDF tends to be used in a different way from industrial particleboard, nevertheless, it is used mainly in the same industry sector, i.e., furniture. The use of one product or the other, therefore, is dependent on the designs developed in the furniture sector. Some may indicate the need for MDF, while others may be satisfied with particleboard, particularly since the quality of particleboard has improved dramatically in recent years.

There are also a wide variety of other uses for MDF which have yet to be developed fully in the US. Door mouldings, millwork, toys and electronic equipment are just some of the potential uses where the particular characteristics of MDF could be applicable. There are also excellent prospects in the general DIY (Do It Yourself) area.

There is very little MDF capacity expansion planned in the US at present even though, currently, supply is very tight. One reason, however, for the pressure on supply has been the very strong export market in the Pacific Rim and Europe. A considerable volume of new capacity is coming on stream in Europe in 1987/88, and this export demand is likely to be curtailed. There is also new capacity in the Pacific Rim. Consequently, though the demand for MDF for consumption in the US is projected to continue to rise in the medium-term, local supply, together with availability from Canada, should be sufficient without significant additional capacity.

Projections for US consumption of MDF are shown in Figure 2-9.

Figure 2-9
Projected US Consumption of MDF
(millions of m^3/y)

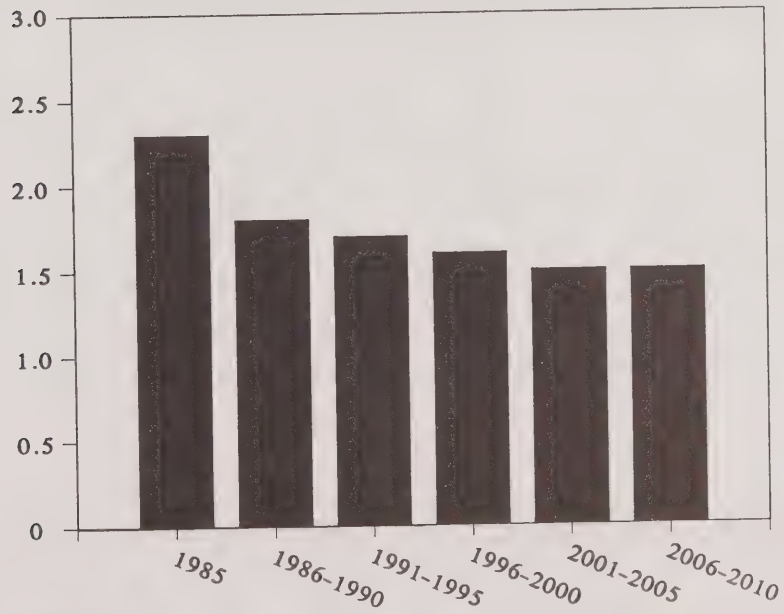


Source: WRA

Significant expansion is expected in the medium-term, but thereafter the growth projected is relatively limited. It is possible that this estimate is overly conservative and that MDF will penetrate the furniture market to a greater extent, in which case the particleboard demand would be reduced. It is also possible that the other uses for MDF will develop to a greater extent than has been projected.

The hardboard market in the US has traditionally been split approximately evenly between siding and other uses. There was a substantial increase in the use of hardboard sidings during the early 1980s, but this product is now coming under severe pressure from vinyl sidings. In addition, uses in other sectors such as furniture and DIY are expected to decline. Projections for US consumption of hardboard are shown in Figure 2-10.

Figure 2-10
Projected US Consumption of Hardboard
(millions of m^3/y)



Source: **WRA**

Currently about 10% of the hardboard used is imported - mainly for uses other than siding. It is expected that, as demand declines, the import share will also drop but that some of the less efficient domestic producers will be forced to close.

Hardwood plywood consumption in the US is difficult to assess accurately. Any figures that are available tend to be on a surface basis and include prefinished panels of less than 5 mm thickness, together with birch or oak-faced boards up to 19 mm thickness. In addition, some of the thicker panels are produced with particleboard or MDF cores.

It is known, however, that there has been a radical decline in the consumption of prefinished panels for interior panelling, and total hardwood plywood shipments dropped from close to 400 million m^2 in the second half of the 1970s to 200 million m^2 currently. Much of this is now used in furniture and general millwork, with decorative panelling taking a smaller share than in the past.

On the basis of the limited information available, it is projected that hardwood plywood consumption should remain relatively static. Any increases in the end-use sectors will be offset by substitution by other products, such as melamine-faced particleboards in kitchen cabinet manufacture.

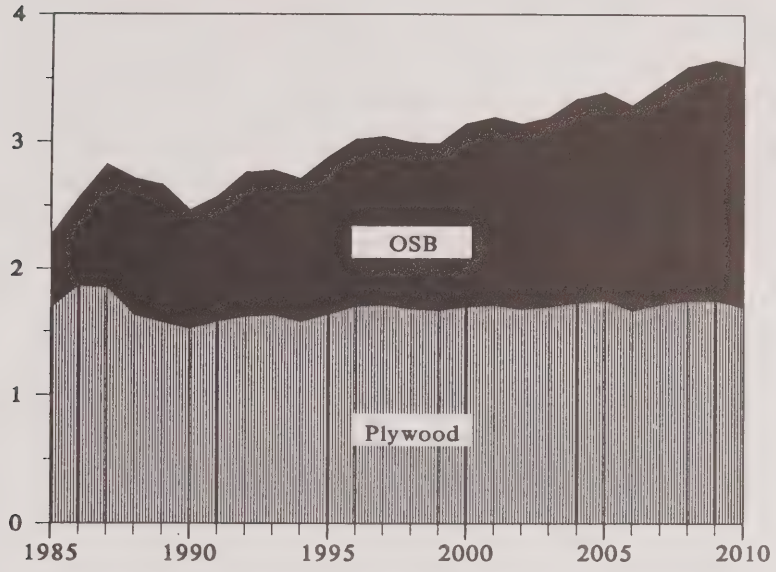
In summary, the outlook for nonstructural board consumption in the US is for some continued growth in total. The products of greatest potential will be particleboard and MDF, whereas hardboard will decline.

The principal wood product opportunities for Canada would appear to lie in particleboard and MDF, though there should be the potential to continue to supply hardwood plywood and, possibly, to replace hardwood veneer exports with plywood.

Canada

The outlook for consumption of structural panels in Canada is somewhat similar to the US (Figure 2-11). Again, it is projected that nonveneered panels will take an increasing share of the market. It is believed, however, that the rapid penetration of reconstituted structural boards is now largely over except in the West. Though virtually all long-term growth will be in OSB/waferboard, the outlook for plywood could be reasonably static.

Figure 2-11
Canadian Consumption of Structural Panels 1985-2010
(millions of m^3)



Source: WRA

Of the total volume of plywood, it is estimated that 300/350,000 m^3 is in the form of sanded plywood and specialties. From the statistical data available in the US, the demand for this type of plywood is relatively static and appears likely to continue so. It is believed that the same situation is likely to exist in Canada and that the current levels of sanded/specialties - perhaps with an increasing emphasis on specialties - are likely to be maintained.

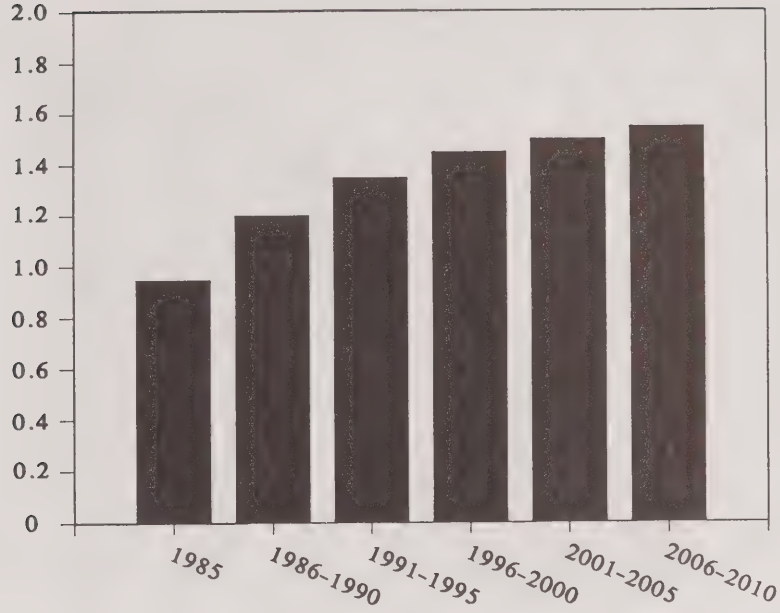
Since the penetration of OSB/waferboard is principally at the expense of rough plywood, the projections infer that, by 1995, the share of nonveneered panels of the total rough plywood plus OSB/waferboard consumed will have risen to 50% from a 1985 level of under 30%. This increase is somewhat below that projected by some other sources, and is predicated on the ability of the plywood industry to produce on a cost competitive basis, and the inherent advantages of plywood in a number of specific uses. In addition, the consumption sector where waferboard is strongest, i.e. residential housing, is expected to decline in importance relative to other uses of structural panels.

The offshore export market has traditionally absorbed about 20% of Canadian production of plywood though recent levels have been much lower. Likely developments in these markets are discussed elsewhere, but the outlook for increased demand is favourable. The ability of Canadian producers to increase sales to these areas will, however, depend on their ability and desire to compete, principally against US producers, but also against possible new supply in the Pacific Rim area. If FTA negotiations result in reduced tariffs between US and Canada and thus in a closer market price relationship between the countries, Canadian producers will be more competitive in offshore markets than in the recent past. Consequently, Canada should regain the market share recently lost to US producers.

Canadian consumption of nonstructural panels has expanded rapidly in the last 10 years. Particleboard consumption in the mid-1980s has been 50% higher than the average for the late 1970s. In addition, the volumes of MDF currently being consumed are over three times the volume estimated for the late 1970s.

It is projected that, in the medium-term, Canadian consumption of particleboard will continue to increase but at a lower rate than in recent years. New capacity is currently being installed which should be sufficient to satisfy immediate demands but, if demand growth continues as projected (Figure 2-12), additional capacity will be required, particularly if net exports to the US increase.

Figure 2-12
Canadian Consumption of Particleboard
(millions of m^3/y)

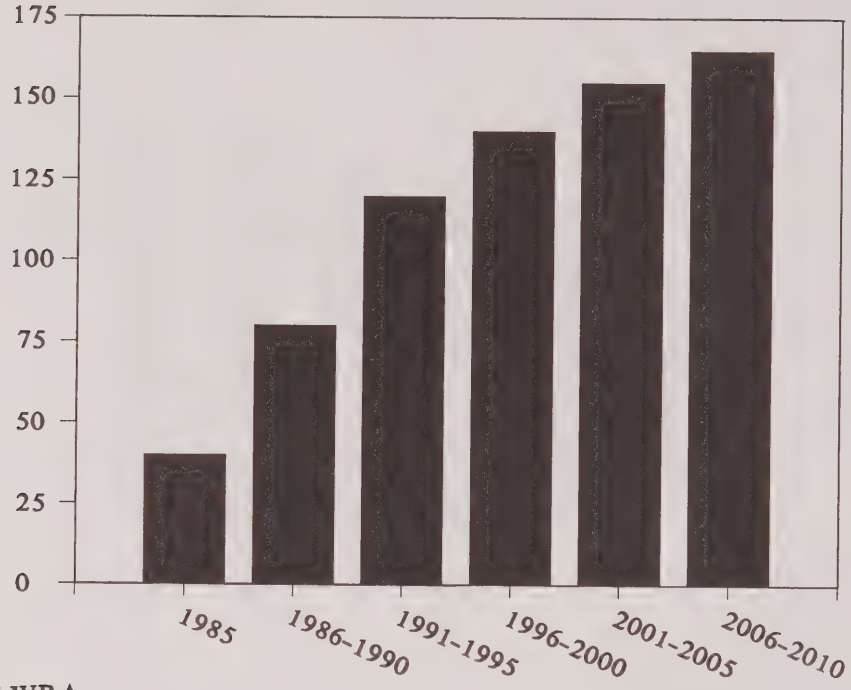


Source: WRA

The great majority of this particleboard is now in the form of industrial quality with the production of underlayment being reduced to well under 25% of the market. Furthermore, most of the newer plants are now wishing to add value to their product and are selling product prefinished with melamine surfaces. As a result, the unfinished product is becoming short in supply.

The projections for MDF reflect the recent introduction of production capacity in Canada. From zero production in 1985, by the end of 1987 there were two plants (Alberta and Quebec). Canadian consumption of MDF is expected to increase substantially in the medium-term as shown in Figure 2-13.

Figure 2-13
Projected Canadian Consumption of MDF
(millions of m^3/y)



Source: WRA

In addition to these volumes of domestic consumption, it is expected that there will be exports to the US and offshore. Consequently, some additional capacity could be justified in the mid-1990s.

Hardwood plywood production in Canada is principally in poplar and birch and has been relatively static for many years. The bulk of the production is consumed domestically (70/85%) and, in addition, hardwood plywood is imported. The total volume of consumption is low relative to other panel products except hardboard. Current consumption is estimated at around 150,000 m^3, and there is little reason to suppose that this will increase significantly. Recent trends have been for a decrease, as hardwood plywood has been replaced by melamine-faced particleboard (particularly in kitchen cabinet and general DIY uses), but it is believed that this trend has slowed.

It is projected, therefore, that hardwood plywood demand should remain relatively static throughout the period at around 150,000 m^3.

Hardboard is also of relatively minor importance, and consumption volumes are expected to decline from current levels of around 160,000 m^3.

In summary, the demand for nonstructural panels is expected to increase significantly in the medium-term, while industrial particleboard, together with MDF, will continue to be the major products.

Japan

Japan is the largest importer of forest products in the world, but emphasis is on raw materials and products for further manufacture in Japan. In the case of wood-based panels Japan has, until recently, been self-sufficient. Japan is encountering difficulty in obtaining hardwood logs from traditional areas in South East Asia, that were, at one time, principal sources of supply. Also the cost of good quality face veneers is rising and the supply is restricted. This has forced the Japanese plywood industry to "rationalize" and there have been government/industry programs in place to encourage an orderly approach.

Imports of plywood will grow substantially as the plywood industry in Japan continues to rationalize. The rate of change will be influenced by changes in the economy and associated construction activity, coupled with variations in the value of the yen in relation to the currencies of potential suppliers. Policy changes affecting log exports from SE Asia, USA, USSR, Canada and other Pacific Rim countries will also have an impact on the melange of Japanese wood product imports.

As part of the rationalization of the plywood industry, Japanese manufacturers are using more softwood veneers for inner plies and increasing the proportion of thicker panels in the product mix. At the present time, they are supplying existing demand for concrete form panels, but this use has future market potential for Canadian manufacturers. However, housing is by far the most important application for coniferous plywood imported from Canada.

Of particular importance to the Canadian plywood industry is the steady growth in platform-frame housing and the potential it represents for increased demand for coniferous plywood. This type of housing and its growth potential has been discussed in some detail in the section on lumber.

In 1986, the Japanese economy, as a whole, slowed down but domestic plywood demand increased modestly, in part because of increased investment in housing.

The number of residential units is said to be in balance with demand, but housing standards are less than satisfactory. A recent study showed that 46% of householders are dissatisfied with the quality and performance of their homes and that the majority of those intending to improve their housing conditions will buy new houses or rebuild. More than two million householders plan to extend or repair their houses. International Research and Marketing (a Tokyo based organization) estimates the repair, renovation and remodelling market at $28 billion annually, or 47% of the yearly housing investment of $60 billion.

The pressures to upgrade the housing stock have been acknowledged by the government, which has stated its intention to adopt policies that will bring about the desired improvements.

It must be recognized that the Japanese economy is not free enterprise in the North American sense. Subtle controls, product standards and regulations governing their use, and industry-wide planning can, and often does, frustrate foreign manufacturers' efforts to build markets there. However, industry leaders and government officials carefully evaluate new or unfamiliar products and their applications. Providing information for these evaluations and the many questions that arise can take a long time, but it can also be rewarding.

The Council of Forest Industries of BC (COFI), with the assistance of the Federal and Provincial governments, successfully introduced the platform-frame system of house construction to Japan. By-laws and codes were eventually changed to permit the building of "platform-frame" houses which use Canadian lumber sizes and coniferous plywood.

To date, expanded use of Canadian plywood has been constrained, in both platform-frame and traditional housing, by Japanese building modules. These modules are firmly established by convention and make the efficient and economic use of 1220 mm x 2440 mm panels (the standard Canadian size) difficult.

However, following years of negotiations, two recent initiatives by the Japanese authorities have acknowledged requests for changes to the building codes covering the construction of platform-frame houses. These negotiations were supported by major house builders in Japan and are of particular interest to manufacturers of panel products.

The Ministry of Construction is in the process of modifying the specifications for platform-frame housing to permit the spacing of supports on modules that favour the use of standard sizes of plywood and other panel products made in Canada. Also, an agreement has been reached that designates COFI as an acceptable foreign testing organization and quality control service. The importance of this agreement to the Canadian plywood industry cannot be overestimated. It permits the inspection and labelling of coniferous plywood in Canada before it is shipped and facilitates and encourages its use by the Japanese construction industry.

A further encouraging factor is that the duty on coniferous plywood is gradually being reduced as result of the last GATT negotiations. It has been reduced from 15% to 10% in 1988.

These changes are positive indications that the Japanese have decided the demand for dimension lumber and structural plywood will grow in the future and the number of platform-frame houses will be allowed to increase.

Coniferous plywood is now familiar to the large Japanese house builders, its quality and performance have been recognized and code acceptances are in place. The future for Canadian plywood sales to Japan is therefore encouraging.

Domestic manufacturers will be encouraged to produce panel products to meet demand arising from increased housing construction but, given the dependence of the industry on imported raw materials, the market for imported plywood will grow. Canada's share will depend on the quality and the continuity and reliability of supply at competitive prices.

Current annual import levels from Canada and US have been limited to 20,000 m^3 and 10,000 m^3 respectively and have shown little sign of significant change. If platform-frame housing grows to the potential 150,000 units projected for 1995, the possible need for a structural panel could be well over 100,000 m^3. In addition, the presence of softwood plywood for one use could encourage other uses.

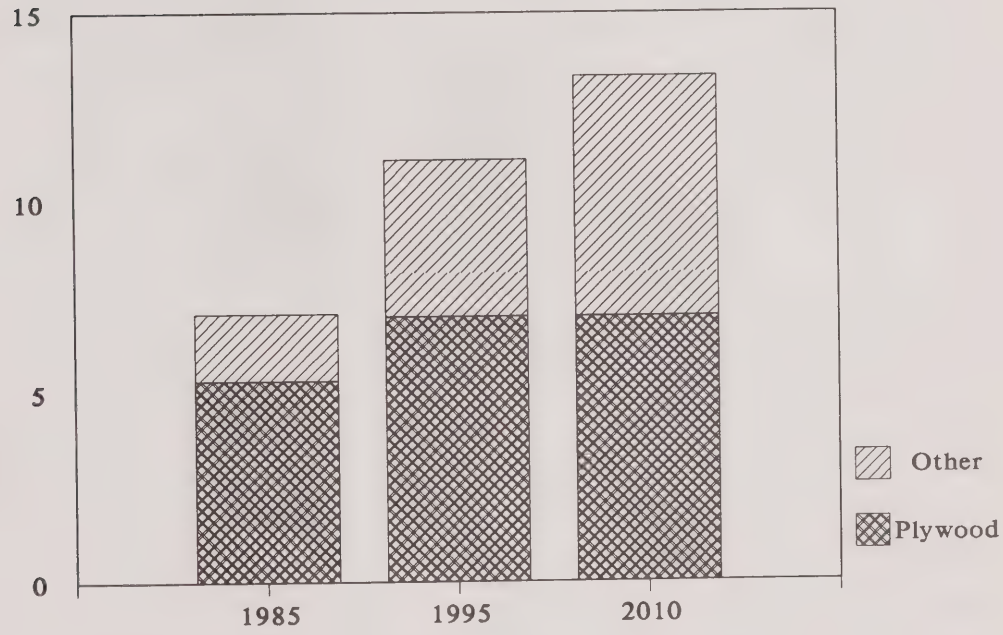
The acceptance of structural panels in the form of softwood plywood should logically lead to the acceptance of substitute products such as waferboard/OSB. It must be emphasized, however, that past experience has proved that developing acceptance of softwood plywood at the consumer level is far from easy, and market acceptance for waferboard/OSB has so far been very limited. Consequently, though there are a number of positive factors becoming apparent, dramatic increases in imports of structural board are by no means certain and will require continued promotional efforts.

At present, the major beneficiaries of the rationalization of the Japanese plywood industry are the hardwood plywood producers--specifically Indonesia. Provided that sufficient and suitable raw material is available, the processing capacity in Indonesia exists to meet a substantial further growth in imports. The Japanese market is accustomed to defect-free surfaces even when the plywood is used for construction purposes. Consequently, the hardwood plywood producers in S.E. Asia constitute severe competition for softwood plywood.

Japanese consumption of other panel products has traditionally been very low. Plywood accounts for 75% of total panel board consumption, in contrast to 15% in Western Europe. Domestic production of particleboards and fibreboards has been relatively limited and imports have been a very minor factor.

This consumption pattern has largely been the result of the strong and versatile plywood industry that used to exist. A major result of the decline of the domestic plywood industry is likely to be a change in approach at the consumer level. Many of the nonstructural uses will increasingly be satisfied by reconstituted boards. Projections for Japanese consumption of panel boards are shown in Figure 2-14.

Figure 2-14
Panel Product Consumption in Japan, by Product
(millions of m^3/yr)

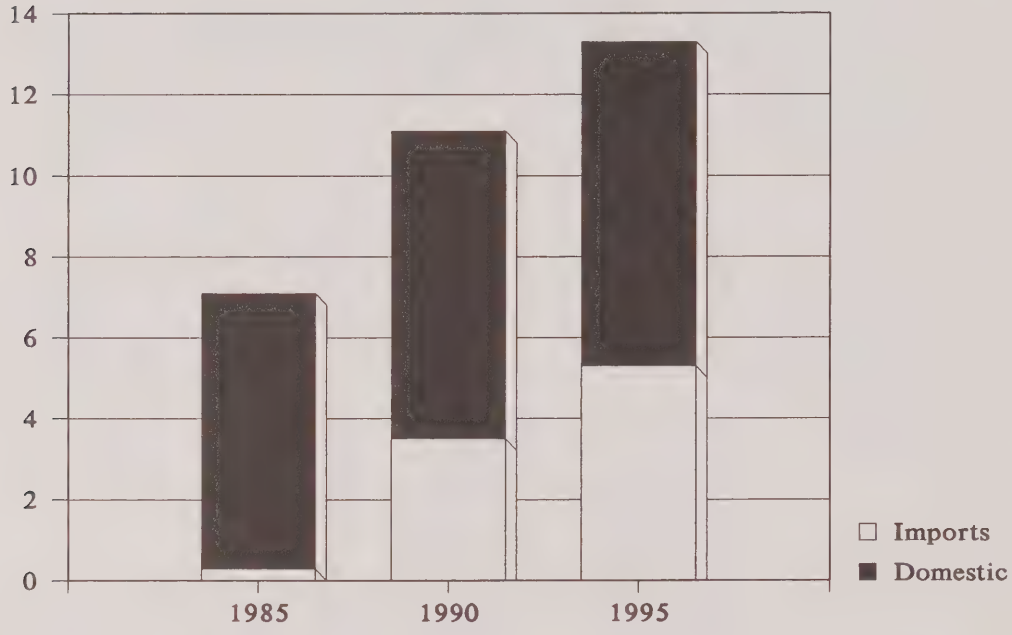


Source: WRA, FAO

Though 1995 appears to be substantially above the 1985 level, there had been a significant decline since the mid-1970s. The reasons were discussed in detail in the section on lumber. Consequently, the 1985 level is particularly depressed. It is projected that the market will recover to earlier levels; much of the increase, however, will be in reconstituted products.

There is also likely to be a significant change in the sources of supply. The balance between domestic and imported products is shown in Figure 2-15.

Figure 2-15
Panel Product Consumption - Japan
By Supply Source
(millions of m^3)



Source: WRA, FAO

Whereas, in 1985, imports only accounted for 5% of consumption, by 1995, this share is projected to increase to 30% and, by 2010, to over 40%.

As can be seen from Figure 2-15, domestic production is expected to increase. These increases are projected to be entirely in the form of reconstituted boards, while plywood production is likely to decrease.

There are significant increases expected in the development of plantation forests in Japan in the long-term. Thinnings and other removals from the domestic forests, plus residue from the sawmilling sector, should provide raw material for part of the increased demand, but it is believed likely that imports will be more attractive. Consumption growth, therefore, will be satisfied by a combination of production--where development of new facilities fits in with the strategy of particular companies--and a substantial volume of import.

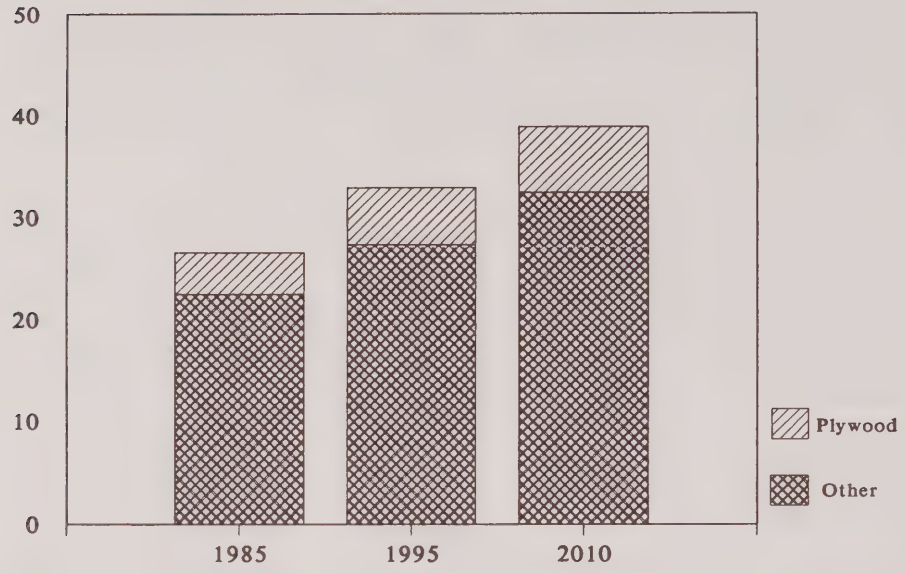
The most important products within the reconstituted board production are likely to be MDF and particleboard. There has already been Japanese investment in offshore MDF production (New Zealand), and it is known that Japanese companies are investigating the opportunities for offshore particleboard production in a number of locations, including Canada and the US.

Western Europe

The factors affecting panel product consumption are essentially similar to those influencing lumber demand. These were discussed in the section describing the market analysis for lumber. Construction is of less overwhelming significance to panel products as a whole, but is of vital importance to the products supplied from Canada (i.e., softwood plywood and possibly waferboard/OSB).

The projections for panel board consumption in Western Europe are shown in Figure 2-16. The increases shown to 1995 are substantial, but the consumption level in 1985 was relatively low, compared with earlier years, and it is believed that even by 1987 there had been significant increases.

Figure 2-16
Panel Product Consumption - Western Europe
By Product
(millions of m^3)



Source: WRA, FAO

Plywood consumption is a small part of the total panel market in Western Europe, and it is not expected that this situation will change in either the medium or long-term. The European market and the producers of reconstituted boards are both world leaders in the relevant technologies. One result has been that a significant volume of the particleboard is produced in a form that is accepted as being suitable for construction purposes. In addition, as discussed earlier, building techniques are different from North America and the need for structural panels is substantially less.

Consumption overall is expected to grow at a little over 1% per annum in the long-term. This growth rate, though significantly below overall economic growth, still represents a substantial increase in total volume--six million m^3. It is projected, however, that domestic production of reconstituted board can expand to satisfy much of the increased demand expected both in the medium and long-term. The availability of raw material from the forest resource, and from the wood products industry, should be sufficient to supply this expansion.

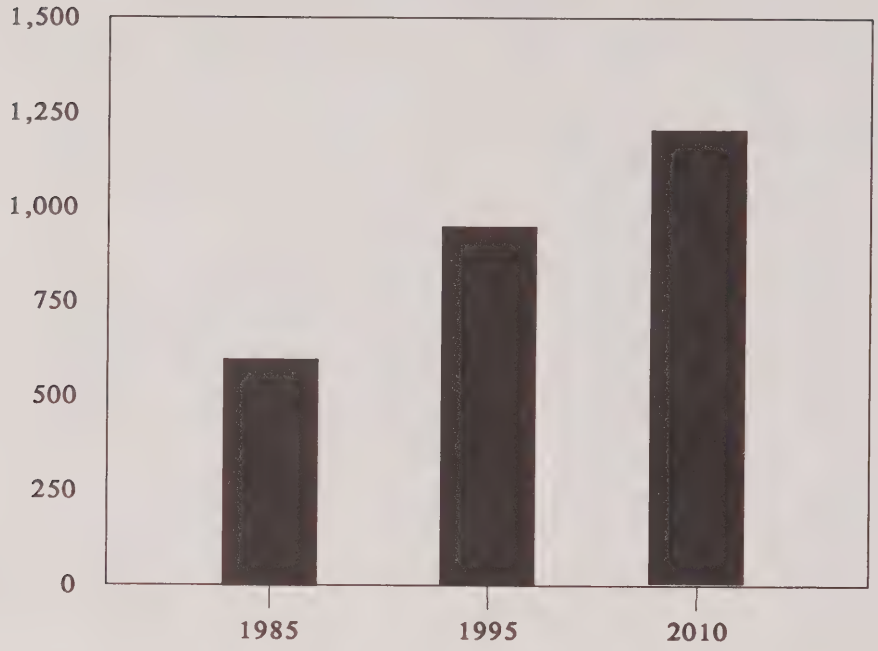
In recent years, there have been dramatic increases in the consumption of MDF in Western Europe. A significant part of this volume has been supplied by imports from North America and even New Zealand. There are, however, a large number of European plants coming onstream, and it is likely that the demand for imports will decline in the short-term. It is quite possible, nevertheless, that Europe will again reach a deficit position if MDF consumption continues its recent growth rate. Therefore, there will possibly be periods of increased import demand before further new capacity is built in Europe.

There are, however, good prospects for steady growth in the relatively small structural panel market. Plywood for concrete forms has an established acceptance in Northern Europe and is likely to be increasingly used in Southern Europe, replacing lumber boards. In addition, timber frame housing is projected to recover in the UK and to continue its growth on the Continent.

Only minor volumes of softwood plywood are produced in Western Europe, and the major share of consumption is satisfied by imports from North America. The outlook for increased imports of softwood plywood is excellent since there is limited potential for increased domestic production.

The projected volumes are shown in Figure 2-17. The increase projected by 1995 is substantial, but it should be noted that, by 1987, close to one-third of the incremental volume had already been achieved. The development of domestic supplies of OSB could have some negative impact on the projected growth. It is believed, however, that after some initial penetration into traditional plywood uses, the presence of locally produced OSB will tend to expand the overall use of structural boards and create new markets, so that additional plywood will still be required.

Figure 2-17
Softwood Plywood Imports - Western Europe
(thousands of m^3)



Source: WRA, FAO

Competitive Position

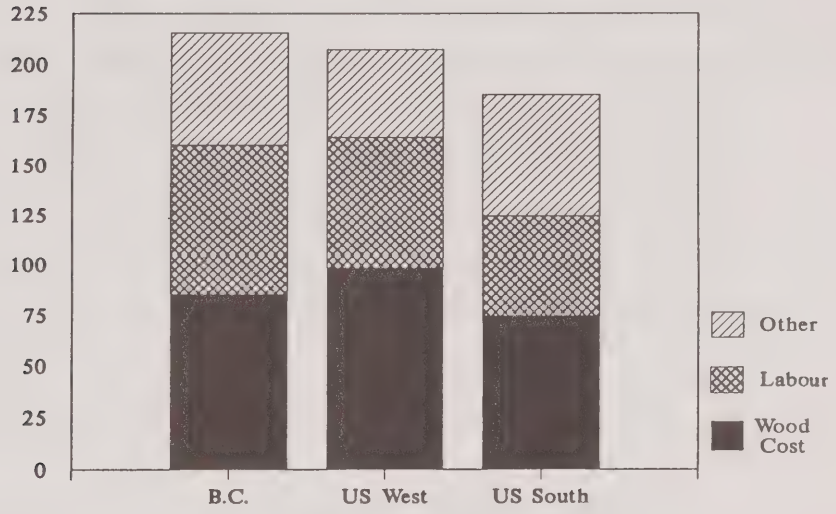
The principle growth opportunities for the Canadian panel products industries lie in North America, Western Europe and Japan. The competitive sources of supply to these areas vary depending on both the particular panel product and the market area.

Softwood Plywood

Subject to any substantive changes in tariffs between Canada and US, the manufacturing cost relationships between plywood producers on the two sides of the border are of little significance relative to sales into Canada or into the US. Canadian sales into the US are very marginal, and US sales into Canada tend to be sporadic, depending on differential market price fluctuations in the two countries.

Where cost comparison is of much greater significance, however, is in competition for export markets. Canadian plywood is facing severe competition from both the US South and the US West in Europe. The comparison of costs shown in Figure 2-18 demonstrates at least part of the reason for the recent loss of market share in Europe.

Figure 2-18
1987 Production Cost - Sheathing Plywood
(Can $/m^3)



Source: WRA,RISI

On the basis of the exchange rate prevalent in 1987, but allowing for higher stumpage costs, the production costs at Canadian mills for regular sheathing are slightly higher than the US West and significantly higher than the US South. It is believed, however, that the BC Interior mills (the major producers of sheathing) can significantly lower costs by modifying their plants to incorporate proven new technology. Indeed, a number of mills have already committed to such investment.

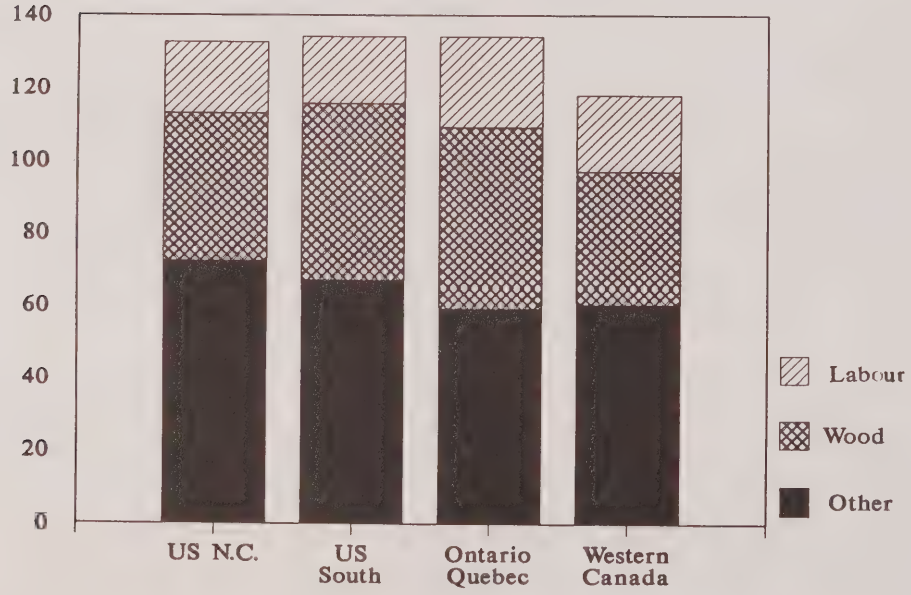
It must be borne in mind, however, that a simple comparison of this nature does not show the wide variations that exist between companies, even in similar locations, nor does it show differences in quality. For example, Canadian plywood is generally accepted in the export markets as being of a higher quality than CDX (see Glossary) from the US South and the market will often pay a premium for the Canadian product.

Production costs are likely to become even more critical in the future. With the exception of some potential in the offshore markets, the principal markets are not likely to grow, and existing producers are expected to compete fiercely for market share.

Waferboard/OSB

The principal opportunities for Canadian producers of waferboard/OSB lie in North America. Growth is expected in the domestic market and Canadian suppliers have traditionally been able to compete in the North East and North Central US and, recently, in the US West. The comparison of production costs in the principal producing regions is shown in Figure 2-19. Average costs in most areas are similar in total, but the very modern facilities in Alberta and BC are estimated to be significantly lower in cost. The major elements included under "other" are binders (resin, wax) and energy. It should be noted, however, that the exchange rate used for the comparison was that current in 1987. The strengthening Canadian dollar would effectively decrease the US costs.

Figure 2-19
1987 Production Cost - OSB/Waferboard
(Can $/m^3)



Source: WRA, RISI

Laminated Veneer Lumber (LVL)

It is believed that there is no significant growth opportunity in the existing plywood industry. There are, however, some recent technological developments which could alter the industry. There is a growing interest in LVL which could have a significant impact on the industry. An offshoot of the plywood industry, in that the product is manufactured from veneer, LVL is sold in lumber form, e.g. 2x12, 30' long. As yet there are few producers and they use much of their production in the manufacture of a second product. There is, however, considerable interest in the future potential of LVL. As development of the use of wood in engineered structures evolves, the need for a high-strength product with closely defined strength characteristics will become more important.

LVL does not necessarily need high-quality veneer, and the product available from relatively small logs is satisfactory. In addition, the new peeling technologies, such as the spindle-less lathe, allow for economic peeling of small logs. The changeover time from discard of the core, to input of the next block, has been reduced to a matter of seconds, and the cores are now very small.

Depending on location and resource, Canadian producers of LVL should be reasonably competitive. There may also be opportunities for PSL (Parallel Strand Lumber), and one company, at least, is confident of the long-term success of this type of high strength specialty product.

Particleboard

The particleboard industry is concentrated in Quebec and Ontario, which account for 45% and 35% of the production respectively. The balance is produced in the Atlantic (5%) and BC (15%).

The majority of production is from either new plants or operations that have been modernized, and there have been significant improvements in quality during the 1980s. In general terms, Canada is self-sufficient in particleboard with imports and exports representing a small share of total consumption. About 80% of the total Canadian consumption is in Quebec and Ontario since the majority of the industry sectors, such as furniture, are located in these two provinces.

In 1987, the demand for particleboard exceeded capacity and many customers were on allocation. Though this situation may be temporary and reflects a peak housing demand, the medium and long-term indications are for a continuing increase in demand both in Canada and for exports.

Raw material availability does not provide a fundamental constraint, since most of the furnish can be in shavings and sawdust. Regionally, the best opportunity for growth is in Quebec and Ontario, and it is estimated that at least two new mills could be required by 1995, with a further two mills by 2010. Canadian producers should be competitive relative to imports from the US.

MDF

There are only two plants in Canada, one in Alberta and the other in Quebec. Both these plants are new and incorporate the latest technologies. These plants have sufficient capacity to satisfy demand in Canada for several years. There may be justification for a further plant in central Canada by the mid/late 1990s, but the more promising growth opportunities lie in the development of facilities for further processing of the raw board. The traditional uses of MDF have been in furniture, but the board is suitable for the development of a great variety of other products. In addition, there appear to be promising opportunities in the Far East particularly if the Japanese market develops as expected. Canadian producers should be competitive based on available wood waste, low energy costs and favourable container rates.

Hardboard

No growth opportunities are foreseen. It is possible that at least one of the three plants that currently exist (in the Atlantic, Quebec and the BC Coast) will be closed in the medium-term.

Regional Implications

BC Coast

The panel product of greatest significance to the BC Coast is softwood plywood. The first BC mills were located in this region and depended on the large-diameter, old-growth, Douglas fir logs. In recent years, there have been some fundamental changes in the industry, and several operations have been closed. The high cost of logs and competition from other regions/products, resulted in coastal mills having great difficulty to break even in the production of lower grades.

The majority of the mills, therefore, emphasize the production of sanded and specialty plywood and, except in peak markets, avoid the production of regular sheathing as far as possible. There is one mill that focuses on sheathing using veneer brought in from the Interior. Some of the other mills also supplement the veneer they peel from Douglas fir and hemlock with spruce from the Interior.

There are seven mills located on the Coast, as of the end of 1987, with a capacity of 800,000 m^3 of production. In addition, a new veneer mill has recently been built, utilizing modern technology, with the ability to peel lower-cost, small-diameter, hemlock logs.

In earlier years, over 30% of the shipments from the Coast were offshore. Since 1985, however, this has declined substantially, principally due to price competition from US West Coast suppliers of sanded plywood.

An increasing volume of specialty products, overlaid with special papers, are being produced by Coastal mills--principally for use in concrete form work. Though it is expected that the demand for sanded plywood should remain reasonably static, it is believed that the potential for innovative specialty products should be excellent. There is a need, however, for some fundamental R&D to develop new products.

There is one particleboard plant on the Coast with a capacity of close to 100,000 m^3. The bulk of the production is industrial grade, together with various specialty items, such as prefinished shelving. Most of the shipments are domestic, but there is an increasing interest in offshore shipments, particularly to Japan. On the basis that Japanese demand for industrial particleboard could increase significantly, there could be an interesting growth opportunity for this product. Though the Coast is in a deficit position for chips, there should be a more than adequate supply of sawdust and shavings for which the current use is hog fuel.

The only other panel product being produced on the Coast is hardboard at a plant that has been in production for many years. With a capacity of about 50,000 m^3, this plant produces standard and specialty products but not siding. Shipments are primarily domestic, but there is a significant volume being exported. The prospect for growth in hardboard products is not encouraging.

There are no OSB or MDF plants on the Coast. A variety of feasibility studies have been undertaken for both these products but, as yet, none has proved viable. OSB depends on the supply of low-cost groundwood, or possibly slabs and edgings, suitable for waferizing. The coastal pulp industry is in a deficit position for raw material, and the value of chips is such that an OSB plant could not compete for supply. A supply opportunity may lie in cedar residues, but even these will be in greater demand by the pulp industry. Furthermore, despite many years of effort, the proponents of a cedar strand board plant have been unable to obtain financing.

The opportunity for growth in MDF appears more promising. Raw material should be available, and significant growth in demand in the Asian market is expected. There is, however, the potential for increased supply from Chile and Oceania, so the MDF market is likely to be highly competitive.

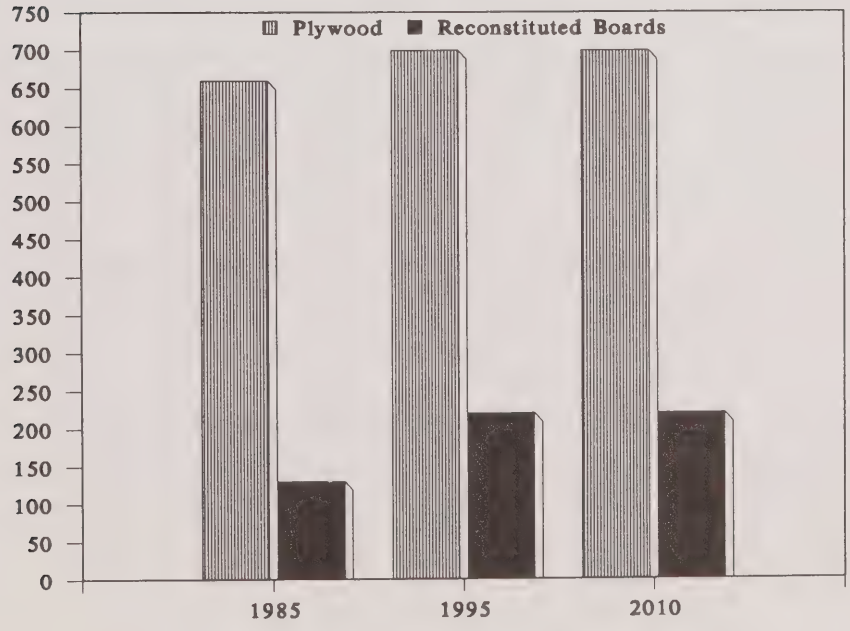
A coastal mill would have significant transportation advantages over existing inland North American mills, and container rates from the West Coast are substantially lower than from New Zealand. There are, however, two significant disadvantages:

- there would be a very limited domestic market available either in Canada or the US due to existing production;
- an MDF plant requires 25-30% chips which are in short supply and expensive on the Coast. Furthermore, the cost of sawdust and shavings could be greater than for some competing suppliers.

Despite these two potential problems, there appears, conceptually, to be the opportunity for an MDF plant on the Coast.

The projection for panel product production on the BC Coastal region is shown in Figure 2-20. Plywood production is expected to remain relatively static (assuming that specialty products will be developed) and the growth relates to nonstructural reconstituted board principally for the Japanese market. There could also be the possibility of growth in the long-term, since the raw material necessary is not expected to be a constraint.

Figure 2-20
BC Coast Production Outlook - Panel Products
(thousands of m^3)



BC Interior

Softwood plywood is the major panel product. There are 10 plywood plants with the capacity to produce almost 1.2 million m^3. The great majority of production is in sheathing, though there is one small mill concentrating on specialty products. In addition, there are six veneer mills, with no lay-up capacity. Some of these mills are tied closely to plywood plants, with no peeling capability in Alberta and the BC Coast, while others sell veneer both within Canada and to the US.

Close to 90% of plywood shipments are to the Canadian market with the balance going offshore. The offshore portion used to be greater, but competition from low-priced Southern Yellow Pine plywood sheathing from the US has been very severe since 1985.

Some Interior operations have recently committed to modernization of their facilities, particularly in the veneer operations. These improvements have the potential to significantly reduce costs below the levels quoted earlier. It is believed, therefore, that the BC Interior industry has the potential, both to compete better against further penetration by waferboard/OSB, and to recover market share offshore.

In contrast to the Coast, there has been little capacity reduction in recent years. The closure of one plant in the early 1980s has been offset by the development of a modern lay-up plant. It is believed that the industry has the potential to survive in the long-term despite recent increases in stumpage. There does not, however, appear to be any significant growth opportunity, and it may be that capacity expansions due to modernization could be offset by the closure of smaller, less efficient operations. There may also be some opportunity to convert veneer operations into plywood plants at some locations.

There is currently one new large oriented waferboard plant with a capacity in excess of 240,000 m^3. The shipment pattern of this mill has not yet stabilized since the facility has only recently started producing. It is likely, however, that, in the long-term, the majority of shipments should be to the US West.

If demand in the US West develops to the same extent as that evident in other parts of North America, there should be growth opportunities for further production capacity in the BC Interior by 1995 and beyond.

The recent explosion of supply in the West has far exceeded the existing demand, and prices are very low. It is likely, however, that this supply pressure and the presence of large volumes of low-priced board in the market will result in a substantial market expansion.

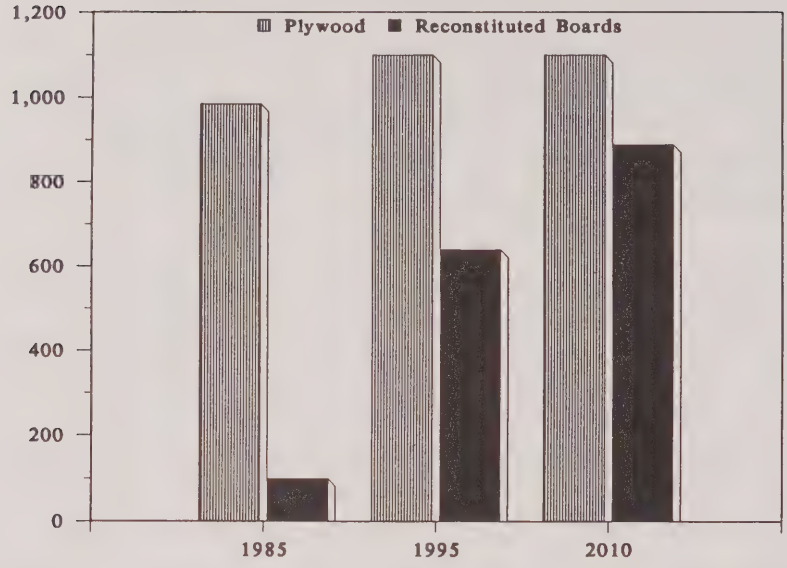
There is also the possibility of market development in Japan but, as noted earlier, this is likely to be very much slower.

The only other panel product manufactured in the Interior--at two plants--is particleboard. One plant is in the process of expanding, after which the total capacity of production will be close to 150,000 m^3 per year. These operations utilize low-cost residues from nearby sawmills and ship virtually all their production domestically. One plant produces mainly industrial grades, whereas the other concentrates on underlayment.

It is not believed that significant growth opportunities exist based on domestic market expansion. However, the export opportunity identified for the BC Coast, in terms of particleboard or MDF, should also exist for the BC Interior. There will be some transportation disadvantages, but the raw material should be readily available at, possibly, lower prices than the BC Coast.

The projections for growth for the BC Interior are shown in Figure 2-21. Substantial additional production is indicated by 1995. Much of this increase is already in place with the Dawson Creek waferboard plant and the expansion of particleboard production at Grand Forks. It is expected that there will be additional facilities established, based on the aspen resource and unutilized forest and sawmill waste. The markets would be the US for structural board and the Far East for nonstructural boards.

Figure 2-21
BC Interior Production Outlook - Panel Products
(thousands of m^3)



Prairies

A variety of panel products are manufactured in the Prairie provinces:

Alberta	3 plywood plants, 1 veneer plant, 1 MDF plant, 3 waferboard/OSB plants
Saskatchewan	1 plywood plant, 1 waferboard plant
Manitoba	None

The capacity of softwood plywood production is 180,000 m^3, and the product has traditionally been sheathing grades. Recently, however, one mill has commenced producing a variety of hardwood plywoods as part of its product line. Two mills have peeling capability, whereas the others depend on purchased veneer, mainly from BC. Though small volumes are exported offshore from time to time, virtually all the production is destined for consumption in Canada.

If the overall market outlook for sheathing grades was for an increase, there would probably be the potential for some expansion. New peeling technologies permit the use of relatively small-diameter logs, and there is good quality spruce available in some areas of Alberta. However, given the relatively static outlook of the market and the presence of a large existing industry, the prospects for investment in new capacity are not encouraging.

The four waferboard/OSB plants currently have a combined capacity of close to 800 million m^3. Over half of the production is sold to the US, and most of the balance is consumed in Western Canada. The US sales are destined for the US West, where there has been a rapid expansion of market acceptance.

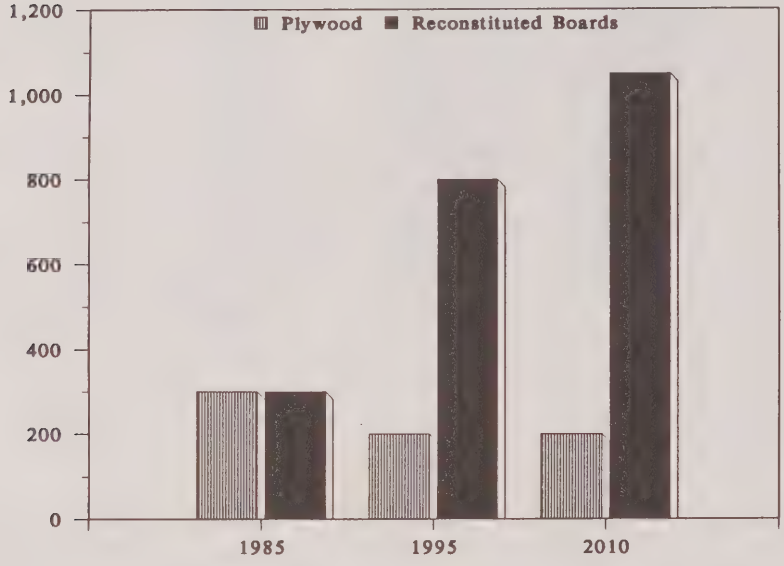
The growth opportunities for OSB/waferboard development in the Prairies are essentially similar to, and competing with, those described for the BC Interior.

Though there are no particleboard or hardboard plants in the Prairie provinces, Canada's first MDF plant was established recently near Edmonton. This plant has a capacity of 90,000 m^3 and has been supplying MDF to Canada and a variety of markets offshore. It is believed that the volumes to the US have been relatively minor due to competition from existing US suppliers.

The prospects for growth in MDF, particleboard or hardboard in the Prairies appear limited. A new MDF plant in Quebec provides substantial competition in Central Canada, and the Western Canadian market is limited in size. Furthermore, a plant in the Prairie region would have significant transportation cost disadvantages relative to a coastal BC operation for offshore sales. These products are relatively heavy, and the cost of land transportation represents an appreciable part of the delivered cost. A possible offsetting advantage could be the availability of low-cost raw material. In addition, there could be locational advantage for access to some specific US markets. Consequently, though the growth opportunity for new facilities does not appear to represent a high priority, it is not totally impossible.

As can be seen from Figure 2-22, substantial growth is projected in the medium and long-term. Much of the growth to 1995 is already in place with recent new facilities for OSB and the MDF plant. In contrast, however, plywood production appears likely to decline. Long-term growth has been limited to one further OSB plant and greater utilization of existing capacity. This projection may be somewhat conservative and is based more on uncertainties about market growth than any constraint imposed by supply.

Figure 2-22
Prairies Production Outlook - Panel Products
(thousands of m^3)



Ontario

Ontario is a major Canadian consumer of all panel products and has a wide variety of production units. There are over 20 plywood and veneer plants located in the province, with a production volume of over 260,000 m^3. The nature of the industry, however, is totally different from that which exists in the West. The majority of the industry is based on hardwood, and only limited volumes of softwood plywood are produced. Almost half of the plywood produced is from poplar/aspen, and the balance is in a variety of species of which the most significant are birch and oak.

Most of the mills peeling hardwood do not have lay-up capacity and sell their veneer, not only to other operations in Canada, but also to the US and a number of offshore markets. The Ontario hardwood plywood manufacturers produce a wide variety of products utilizing particleboard and poplar cores. There are also specialty operations producing hockey stick components, drawer sides, moulded chair backs, overlaid plywood for signs and so on.

There is little doubt that there are significant expansion opportunities in a number of market niches. The supply of hardwood logs suitable for peeling is limited in the valuable species such as birch and oak, but the new peeling technologies extend the supply of poplar/aspen.

These new technologies could also have a significant impact on softwood plywood production. Much of the softwood plywood produced in the West is consumed in Ontario, and Ontario has been unable to produce softwood plywood due to the lack of suitable peeler logs. It is now economically viable to peel logs with an average diameter of well under 20 cm. It is believed that there could well be areas in Ontario where a consistent supply of logs in this category could be found to justify a mill. Such a mill would have substantial transportation advantages relative to Western mills.

In addition, the opportunity to develop LVL facilities based on these logs, would appear very promising. The proximity of major consumption areas would be particularly advantageous. Both the aspen/poplar resource and the softwoods could be suitable raw material furnish. A fundamental problem which is, at present, constraining development in this product, is the lack of knowledge of, and confidence in, the market potential.

There are five particleboard mills but no MDF facilities in Ontario. These operations have the capacity to produce close to 450,000 m^3 of particleboard, most of which is in industrial grades. In addition, a number of the mills are supplying melamine-faced boards. Specific statistics on exports from Ontario producers are not available, but it appears likely that close to 90% of shipments are into the Canadian market.

The prospects for growth in particleboard production are promising. Consumption in Canada is expected to grow, and the large US North East and North Central regions are also expected to increase demand. These US regions are already substantial importers of particleboard from other parts of the US, compared with which Ontario could have significant transportation advantages. An initial analysis of the current sawmill residue usage indicates that there could be some areas where sufficient supply would be readily available.

Ontario also produces a large volume of waferboard/OSB, accounting for about 35% of Canadian production. At the end of 1987, there were four plants operating with a capacity of around 550,000 m^3. One plant had recently been closed, but a major new operation is due to come into production in 1988.

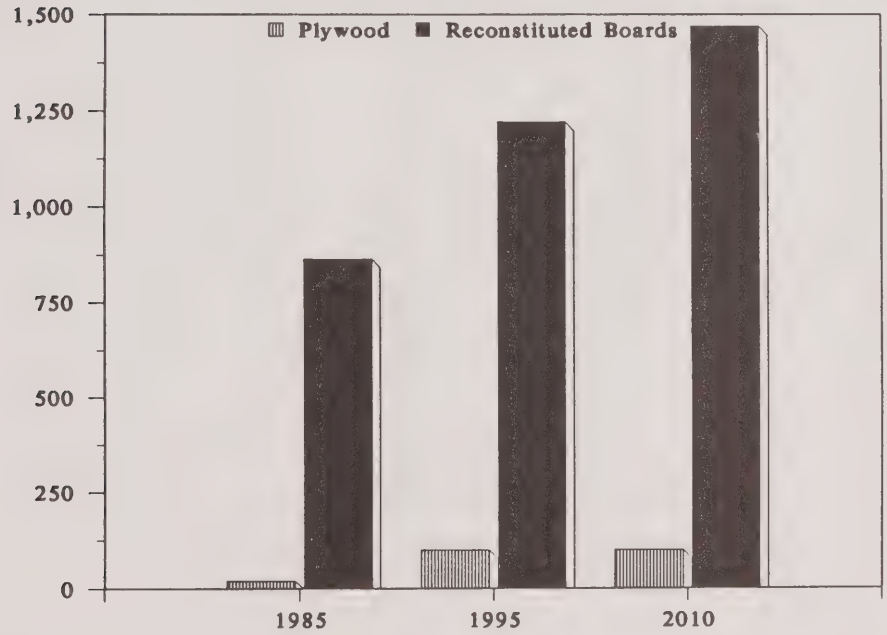
Ontario is a major consumer of waferboard, and it is believed that over 60% of production is sold domestically with the balance being shipped to the US. Prices have been very poor in recent years and, at the end of 1987, were lower than at any time since regular price information has been available. Consequently, only the most efficient operations, or those with particularly favourable wood or delivery costs, are making any money.

On the basis of projected increased consumption in Central Canada, plus that in the North East and North Central US, there is an apparent need for a substantial number of plants. Ontario has an aspen resource that would be very suitable. However, it seems likely that current poor financial returns could limit the prospects of further growth until the early/mid-1990s. By 1995, however, there should be the opportunity for at least two to three new plants in Ontario and Quebec with some additional operations in the longer term. There will first have to be a dramatic increase in mill returns for waferboard/OSB. If there is no such increase, there is a real possibility of short-term closures of the less efficient mills.

There is one hardboard plant in Ontario selling most of its product domestically. There do not appear to be any significant growth opportunities for this product.

Significant growth is projected in Ontario for the production of panel products (Figure 2-23). Some growth has been projected for plywood as a result of the estimated impact of new technologies which will both permit the peeling of smaller logs and development of new products (LVL). The major growth, however, will be in reconstituted boards. Good market opportunities for particleboard/MDF should encourage the establishment of at least one new facility for nonstructural boards. In addition, by the mid-1990s there should be the opportunity for a further OSB plant.

Figure 2-23
Ontario Production Outlook - Panel Products
(thousands of m^3)



Quebec

The majority of panel product activity in Quebec relates to reconstituted boards. The plywood and veneer industry has many plants, but most of these are relatively small and depend on hardwoods.

The situation for the plywood and veneer industry is much the same as that described earlier for Ontario.

There are three particleboard plants and one MDF plant currently operating in Quebec. The MDF mill commenced full operation in 1988 and has a capacity of about 100,000 m^3. One of the particleboard plants (built in 1985) is the largest in Canada. This plant not only produces industrial grade particleboard, but also has the ability to carry out a substantial amount of further processing.

The total particleboard capacity in Quebec is over 650,000 m^3 and, in 1987, the plants were operating at capacity. About 80% of production is shipped domestically (mainly to Quebec and Ontario) and almost all the balance is exported to the US.

Provided that suitable low-cost raw material can be obtained, the prospects for growth in particleboard/MDF are promising. The markets that can be accessed from a Quebec location are projected to expand significantly. There may also be the opportunity to expand to Europe if the advantages of wood cost and energy can offset the substantial transportation disadvantages. It must be expected, however, that the competition from the very large and established industry in Europe will be severe.

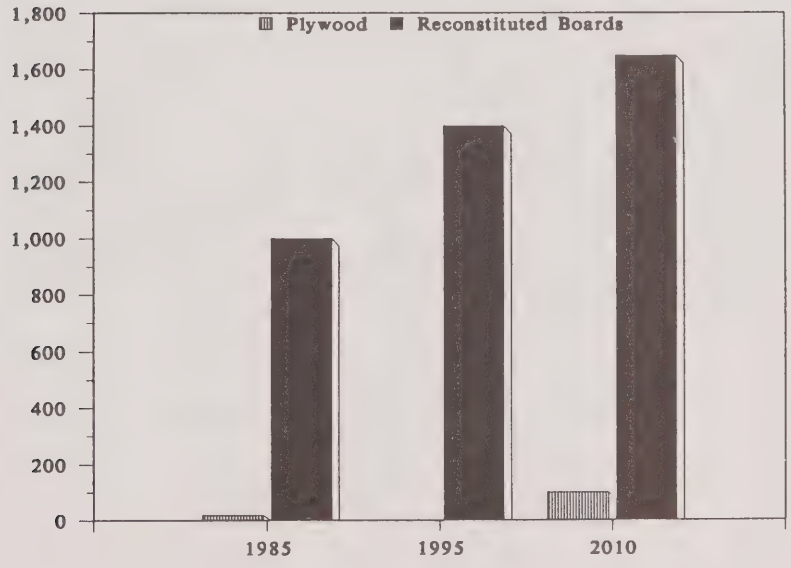
The waferboard/OSB industry in Quebec has expanded rapidly in recent years. From a zero base in 1980, there will be four mills by the end of 1988 with a capacity of close to 600,000 m^3. This volume is almost double the production estimated for 1987. Though precise data is not available, it is believed that over 50% of production is currently being exported to the US.

Based on the market outlook and the likely volumes of aspen available, there would appear to be excellent opportunities for further expansion in capacity. However, bearing in mind the very recent growth of availability from Quebec and the low current returns resulting from overcapacity, it may be that there will be no further expansion until the early 1990s.

There are no hardboard mills in Quebec, and it seems unlikely that a mill would be developed.

Projected growth for panelboard production in Quebec is shown in Figure 2-24. Since both Quebec and Ontario have similar market opportunities and similar resources, the outlook for Quebec is reasonably similar to that shown for Ontario. The growth opportunity lies in reconstituted boards. It is also possible that Quebec operators could develop softwood plywood on LVL facilities and, on a totally arbitrary basis, this volume has been projected for the longer term.

Figure 2-24
Quebec Production Outlook - Panel Products
(thousands of m^3)



Atlantic

The panel product operations of any significance in the Atlantic provinces are one particleboard plant, one OSB plant and one hardboard plant.

The particleboard plant has undergone modernization recently and currently has the capacity to produce over 150,000 m^3. There could be the possibility to further expand the plant, based on market driven opportunities, but the particular situation of the operation relative to raw material availability is not known.

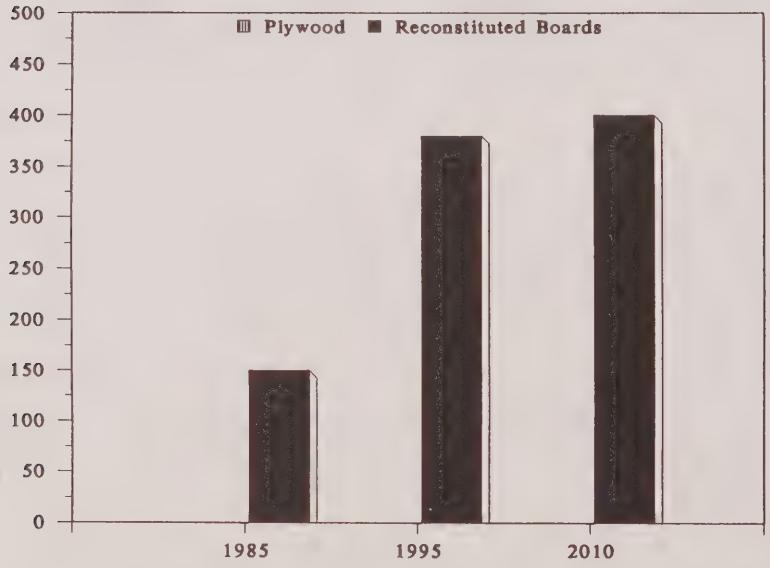
The OSB plant has recently been modernized and reopened after some years of closure. The new capacity is over 200,000 m^3, and it appears likely that over 50% of the production will be destined for the US market. It is also possible that growth in interest in European markets, resulting from new capacity in that region, could offer an opportunity for offshore exports.

The Atlantic provinces are reasonably well placed to compete for the NE US market, which is projected to expand consumption of waferboard/OSB by over one million m^3 by 1995. Consequently, if an economic supply of aspen is available, there could be the opportunity for another economy of scale plant.

The hardboard plant has recently been modernized, but the viability of further growth in this product appears limited.

The outlook for panelboard production is shown in Figure 2-25. The growth shown reflects the modernized OSB plant. The projections do not show a further OSB plant to serve the North East US since there is some uncertainty whether a contiguous supply of suitable aspen could be identified.

Figure 2-25
Atlantic Production Outlook - Panel Products
(thousands of m^3)

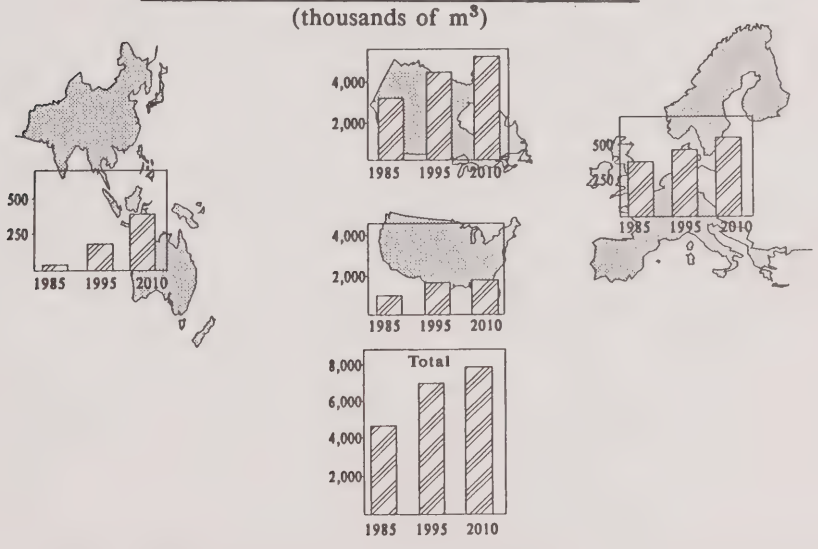


Woodbridge, Reed and Associates

Total Canada

Based on the market opportunities, there are substantial growth opportunities for the development of panelboard production in Canada. Furthermore, in contrast to lumber, there appears to be little constraint from the point of view of raw material. Virtually all the growth is in reconstituted products depending on aspen or unutilized waste from the sawmilling industry. The projections for shipments by major destination are shown in Figure 2-26.

Figure 2-26
Canadian Panel Product Market Opportunity
(thousands of m^3)



NOTE: Volumes in Europe and Asia are on a different scale.

Source: Statistics Canada, WRA

It should be noted that a substantial part of the growth shown to 1995 has either already occurred by 1987 or else capacity is currently being installed. The majority of the increase relates to incremental consumption within Canada, and by 1987, the consumption level had already increased substantially. Consequently, the 1995 projection is little more than 5% higher than recent peak demands.

The increases shown for shipments to Asia could be significantly understated if the Japanese market develops to the extent possible. There will, however, be strong competition from low-cost areas such as Chile.

GLOSSARY OF TERMS

Baby squares	A generic lumber product having a square cross section and typically destined for the Japanese market in a variety of sizes around 100 mm x 100 mm x 4 m.
BBF	Billion board feet (see also fbm).
Bush mill	Small sawmill operation, often portable, family owned and operated and seasonally operated in conjunction with logging or agricultural employment.
Cant	The squared off part of a log after the initial saw has removed the outside edges and, possibly one or more boards.
CDX	A US grade of plywood for exterior application employing 'C' and 'D' grade face veneers.
Chip-N-Saw	A proprietary maker's name for a sawmill headrig in which the log is both chipped and sawn to produce lumber in a single pass.
Chipper canter	A sawmill headrig in which flats are milled on adjacent faces of the log at right angles to each other, running the entire length of the log.
cm	Centimetre - metric unit of length.
cm^2	Square centimetre- metric unit of area.
COFI	Council of Forest Industries of BC
Commodity grade	A standard grading of lumber widely traded and appropriate for use in many applications.
Construction grade	A visual grading of lumber appropriate for load-bearing applications especially in residential shelter.
D.B.H.	Diameter of a standing tree at breast height--arbitrarily defined as 4.5 feet above ground level.
DIY	Do-It-Yourself. Home improvement undertaken by the owner.

Dunnage	Padding material used to protect products from damage during transportation.
Economy of scale	Economically sized mill, approximately achieving the lowest average cost per unit of production in relation to discrete major items of capital equipment.
Edge gluing	A process of joining two or more pieces of lumber together to produce a product of greater width.
EEC	European Economic Community. A grouping of European countries (currently 12 in number) for trading purposes.
ETTS IV	The fourth in the series of European Timber Trends Studies.
FAO	Food and Agriculture Organization of the United Nations.
fbm	Foot board measure. Equal to a lumber volume of one twelfth of a cubic foot. (Mfbm is thousand fbm, and MMfbm is million fbm).
FTA	Free Trade Agreement. A proposed removal of trade restrictions between Canada and the US.
GATT	General Agreement on Tariffs and Trade
GDP	Gross domestic product. The measure of production within a geographic region in a specified period.
GNP	Gross national product. The total value of goods and services produced in a nation in a specified period.
Green chain	The sawmill conveyor deck from which lumber is sorted by grade, length and cross sections.
Greenfield	A facility constructed on a site where no such facility existed before.
Hardboard	A wood panel product made primarily from partly refined wood fibres that are consolidated using a combination of pressure, heat and moisture.
Hardwood	Wood from nonconiferous trees.

Hwd	Abbreviation for hardwood.
Jacket board	The outer board sawn from a log.
Kerf	The actual width of the saw cut.
Kiln dried	Wood dried in a kiln with the use of an external heat source.
Lay-up	The process of assembly of glued wood veneers in the production of plywood.
LVL	Laminated veneer lumber. A structural lumber product made from sheets of veneer all with their grain oriented longitudinally, bonded together.
MDF	Medium density fibreboard. A dry formed panel product made from wood flakes combined with synthetic resin and compressed under heat.
Merry-go-rounds	The decks and conveyors needed to recirculate wood products for further processing within a sawmill.
m^3	Cubic metre
m^3/y	Cubic metres per year
mm	Millimetre--a metric unit of length.
MSR	Machine stress rated. Lumber that has been non-destructively tested to indicate its strength values such as modules of elasticity.
Multi circular saw cant gang	A secondary breakdown sawmill machine for converting cants into boards in a single pass.
Nordic countries	Norway, Sweden and Finland
OSB	Oriented strand board. A panel product made with aligned wood strands bonded with waterproof resin.
Panel board	One of a wide variety of wood-based products sold in sheet form.
Particleboard	A panel product made from milled wood particles combined and bonded with resin under controlled heat and pressure.
Platform-frame	A style of house building most widely employed in North America in which successive wooden floors are supported on walls framed with lumber.

Pocket chipping edger	Sawmill machinery for recovering alternative smaller cross sections of marketable lumber from waney boards and edgings.
Primary breakdown	The initial sawing process in the reduction of logs to lumber.
Profile canter	A type of sawmill headrig in which the circular cross section of the log is converted to one of a family of clustered rectangular cross sections by a series of chippers.
PSL	Parallel strand lumber. A structural lumber product made with aligned wood strands (pieces of veneer) bonded with waterproof resin.
PVC	Poly-vinyl chloride. A plastic competing with wood in products such as windows, mouldings, siding.
Random Lengths	A trade publication focused on frequent listing of prices of wide range of North American wood products.
Reconstituted board	A panel product made by bonding and pressing veneers, flakes, wafers or particles of wood.
RISI	Resource Information Systems Inc., a Massachusetts-based forest industries forecasting consultant.
Rotary cant gang	Sawmill machinery for breaking down cants or flitches to produce boards or dimension lumber.
Scandinavia	Norway, Sweden, Finland and Denmark.
Scragg	A type of sawmill headrig in which a log is broken down by circular saws.
Softwood	Wood from coniferous trees.
S-P-F	Spruce-Pine-Fir. A commercial designation of a combination of species comprising White Spruce, Engelmann Spruce, Black Spruce, Red Spruce, Lodgepole Pine, Jack Pine, Alpine Fir, Balsam Fir.
Stumpage	The fee paid by tenure holders for timber cut on Crown Lands.

Swd	Abbreviation for softwood
t	Tonne, or metric ton, 1,000 kg. Not to be confused with short ton which is 0.909 tonnes.
TFL	Tree farm license
Tight grained	A grading of wood in which the annual growth rings are close together, usually corresponding to a desirable dense and slow growing wood.
tpd	Metric tonnes per day
tpy	Metric tonnes per year
Truss	A braced frame of mechanically connected lumber parts designed to transfer roof loads to the supporting walls.
TSA	Timber supply area
Underlayment	Smooth surfaced wood panels used for flooring on which another surface material--such as carpet or lino--is to be placed.
Waferboard	A panel product made from milled dried wood flakes combined with a synthetic adhesive and formed into a flat panel under controlled heat and pressure.
Wane	Bark or lack of wood on the edge or corner of a piece of lumber.
Waney cants	A lack of wood on the edge or corner of a cant due to the outside surface of the log appearing within the envelope of the sawn rectangular cant section.
WRA	Woodbridge, Reed and Associates.

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